

The Theory of Everything

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The theory of everything else, from bike-helmet laws to eco-beer.



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San Diego: The Fittest City

Ocean views, perfect weather, killer Cali-Baja cuisine, and a vibrant, multiethnic, multisport vibe. Those are just a few of the reasons why the Olympic Training Center picked San Diego for its home base and why thousands of surfers, triathletes, and yoga enthusiasts call the city home.

Surfing

THE SCENE: From kid-friendly beaches to legendary breaks, San Diego is home to nearly a hundred surf spots.

TRAINING GROUNDS:

"I've surfed all over the world," explains San Diego County resident and surfing legend Rob Machado. "There are not many places that are so compact with so many good surf spots." Legendary breaks like Pipes at San Elijo State Beach, Swami's in Encinitas, and Seaside Reef in Cardiff-by-the-Sea are world-renowned, while grommets (a.k.a. newbies) can hone their craft on the gentler waves at places like La Jolla Shores.

EVENTS: There's a constant calendar of amateur and pro surfing events, but the Annual Switchfoot Bro-Am at Moonlight Beach in Encinitas—which includes Nerf

surf-jousting and a star-filled beachside concert—is the most entertaining.

INSIDER'S TIP:

Tourmaline Surfing Park at North Pacific Beach is a great place for beginners to mingle with old hands and get a taste of authentic surf culture.

Triathlon

THE SCENE: With a high concentration of triathlon clubs and coaches, ideal year-round weather, protected ocean

training, and tons of great events, San Diego is the epicenter of all things tri.

TRAINING GROUNDS:

The Tri Club of San Diego hosts a workout finder that lets you find formal and informal group training events from ocean swims and pool training to beginner and expert road workouts all over the region.

EVENTS: TriRock San Diego, the city's largest, is an athlete favorite, with a protected swim in San Diego Harbor and gorgeous views of downtown during flat and fast rides.

But the granddaddy of San Diego distance challenges is the Superfrog, a half-Ironman started in 1979 by a group of Navy SEALs to help them train for the Hawaii Ironman.

INSIDER'S TIP:

Need new shoes or looking for training partners? Head to the Endurance House, a shop that specializes in tri gear.

Yoga

THE SCENE: With miles of yoga-friendly beaches and dozens and dozens of yoga centers and luxury healing retreats, yoga is an



integral part of the fabric of the city.

TRAINING GROUNDS:

At Mission Bay Aquatic Center, instructors lead SUPCore Yoga classes on stand-up paddleboards in the bay's calm waters. Staying upright while holding Warrior II? That will firm your core in no time. Head over to Del Mar Beach, where each Sunday you can work on your vinyasa flow with waves lapping at your yoga mat. And during the summer,

Yoga Rocks the Park offers classes all over the city, from Liberty Station in Pt. Loma to classes merged with live music at San Diego's Waterfront Park.

INSIDER'S TIP:

If you're more boozy brunch than bikram, check out Hoppy Yoga: a series of sessions held in San Diego's craft breweries. Here, yogis of all levels can get their sweat on and cool down with a cold one, fresh from the tap.



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34 Destinations

New Zealand: The only problem you'll have in the planet's ultimate adventure mecca is deciding what to do first. Paddling, mountain biking, heli-fishing, stargazing, wine sipping—the fun menu is unlimited. **Adventure Beta:** First tracks are always yours at these backcountry huts.

42 Essentials

Wanted: A hand-shaped snowboard custom-built for steepes and trees. **Stress Tested:** Versatile down-alternative jackets. **Upgrade:** Ski-hut necessities. **Outfitted:** The perfect après kit. **Lowdown:** Gear subscriptions are here.



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"I felt a lot of emotions cruising around the South Island—mostly bliss and awe, with the occasional surge of terror when I forgot to drive on the left—but FOMO wasn't one of them."

—SAM MOULTON, PAGE 34

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EXPOSURE



Dan Medhurst

Last September, Medhurst visited Kazakhstan's remote Charyn National Park, near the border with China and Kyrgyzstan, with writer Tristan Kennedy. Over three days mountain-biking along the park's 700-foot cliffs, they saw almost no one, apart from the driver of the 4x4 that took them to the top of Charyn Canyon, where the photographer captured Kennedy and his brother, Rowan. "It was important to show how massive and empty the place was," says Medhurst, who lives in London. "There was nobody there but us."

+

THE TOOLS:

Canon 1D X, 70–200mm
f/2.8 lens, ISO 500, f/5.6,
1/2,000 second



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「EXPOSURE」





Mike Schirf

Marcus Caston was almost certainly the first person of the season to ski the fjords in Nordur fjörður, Iceland, where he and Schirf traveled last April. “The roads were just being cleared up,” says Schirf. “Marcus spotted this line and said, ‘I want to jump off that corner.’” Schirf, who lives in Salt Lake City, followed Caston to the top of a 1,500-foot run, wearing crampons on the climb to keep his footing in the icy spring conditions. “I was a little nervous, but Marcus hit it like a true pro. It’s definitely my favorite shot of the trip.”

+

THE TOOLS:

Canon 1D X, 24–70mm
f/2.8 lens, ISO 200,
f/5.6, 1/1,250 second

EXPOSURE



+

THE TOOLS:
Sony A7,
Voigtlander 15mm
f/4.5 lens, ISO 500,
f/8, 1/400 second

Cheyne Lempe

Six months out of the year, 24-year-old Lempe lives in Yosemite Valley, California, where he was eager to take a group of friends to a favorite spot behind Middle Cathedral Rock. There he captured Colin Harkins slacklining above a pool along Bridalveil Creek. "It's one of Yosemite's hidden gems," says Lempe, who pulled himself across a rope he'd tied to two giant pine trees, 50 feet above the pool, after leading the group on a three-hour hike. "They'd started wondering aloud if it was worth it, but as soon as we got there they were totally stoked."



THE

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MALIA REEVES

TAOS RESIDENT, ARTIST AND SKI PATROLLER

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King of the Mountains

As technical director for the American Mountain Guides Association, Dale Remsberg's job is to make sure the country's elite guides are on their game

DALE REMSBERG FELL IN LOVE

with the mountains as a kid in the Pacific Northwest. Now, as technical director for the American Mountain Guides Association, they're his office. "Right from my very first AMGA course, I just knew that to make guiding a career, I had to become an AMGA guide."

Now certified to guide skiers and climbers across the world, Remsberg also teaches aspiring guides the finer points of mountain safety. "It's very intellectual when your clients are young guides. You have to make sure you're on top of your game."

Safety is a guide's biggest priority, and having reliable, high-performance equipment isn't negotiable. "Your gear has to do its job so you can focus on decision-making," he



"It's very intellectual when your clients are young guides. You have to make sure you're on top of your game."

says. That's why Casio Pro Trek PRW3500 is essential: Its barometer allows Remsberg to keep an eye on changing weather in remote locations, and its precision altimeter helps him navigate at night or in whiteout conditions. "It has to be accurate," he says, which is why Pro Trek partnered with AMGA to provide watches to all of its instructors.



With altitude readings to within a meter, a solar-charging battery, and buttons that are easy to use even with gloves on, Remsberg relies on the Pro Trek whether he's climbing at home in the Flatirons in Boulder, Colorado or guiding in Alaska and Patagonia. "I have clients that I've been working with for 15 years," he says. "That's what high-level guiding is—taking people into the wild places and doing it safely and competently."



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PRW3500

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PRW6000

Altimeter/Barometer, Compass,
Thermometer

Solar-Powered

Barometric pressure
tendency alarm

Smart Access electronic crown

Fly-Back Hands, so measurement
displays are always visible

Carbon-fiber insert band for strength

Full Auto Double LED Lights



BETWEEN *the* LINES

feedback



Our Adventure Disorder

Given the title of this magazine, it's probably no surprise that we get the bullhorn out whenever research is published about the positive effects of time spent outdoors on the human brain and our overall wellness. As we've reported in the past, activities as simple as taking a short walk or smelling the forest soil—or even just staring at a photograph of the ocean—can profoundly counteract the stress and fatigue associated with our plugged in, screen-addled lifestyles. *Outside* plays a role in the digital deluge, of course. We contribute to the social-media firehose on an hourly basis via multiple feeds on Twitter, Facebook, and Instagram. We load inboxes with daily e-mails offering our latest Web exclusives on fitness, gear, and travel. We transmit 24-hour programming on Outside Television. And we're about to launch a podcast series, so you can finally take us on your next hike or run. Still, it's reassuring to know that the active life spent outside that this magazine has trumpeted for nearly four decades is emerging as one of the most important survival tools and secrets to good health in the 21st century.

For the past five years, longtime contributing editor Florence Williams has been our go-to reporter on this topic, exploring the feedback loop between our brains and nature and distilling some of the latest, most complicated science on fear, adrenaline, stress, and wellness into fascinating narratives. This month we've got her latest addition to this growing canon, a story about educating kids with attention

deficit hyperactivity disorder ("ADHD Is Fuel for Adventure," page 60). As Williams reports, a new boarding school in North Carolina is discovering that taking ADHD-suffering kids out of the classroom and into nature can radically improve behavior and stimulate learning. What's more surprising is the link between the condition and adventure that she investigates along the way. Williams discovers that the acute hyperactivity and distractibility long considered dysfunctional—"symptoms" frequently treated with a barrage of medications—might actually be part of a crucial skill set that not only helped our prehistoric ancestors thrive, but also keeps some of this era's most celebrated adventurers alive in the wild.

—CHRISTOPHER KEYES (@KEYESER)



Superwoman

For "Earle Power" (November), Ian Frazier got to know legendary biologist Sylvia Earle, who now works to establish marine sanctuaries where underwater life can be protected from pollution and overfishing. Earle has no shortage of admirers (who doesn't want to see our oceans preserved?), but her prospects for success are uncertain.

If anyone can instruct us on how to save the oceans, she is the lady we should be listening to. I'm so excited to be starting my education in biology and to begin a career helping the environment. **EMILY KATE MILLIER** Basingstoke, England

Sylvia has done more than any other person to help us see fish as individuals, each with its own unique personality, and that fish-

ing is not a game to them—it's life or death. I would add just one thing to her daughter's list of ways that ordinary people can help fish: stop eating them.

PAULA MOORE Portsmouth, Virginia

Kudos to Sylvia Earle for helping create marine sanctuaries around the world. I don't see the depth in this solution, however, as a long-term approach to saving the oceans. Nor does her emotional bond with fish seem connected to rational management of our resources. She just loves fish, as if they are puppies. If the mission is raising awareness of how we humans are decimating the very ocean life we depend on, a rational argument—appealing to our self-interest—is the only one people will really hear. **BRIAN FLATT** Online

Another Reader Living Bravely

Jason Mullin (left), who turned 50 in November, has read every issue of the magazine since 1991. Between 1992 and 1994, he had his subscription forwarded to the shack in Papua New Guinea where he and his wife, Tania D. Bolduc, lived while serving in the Peace Corps.



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BETWEEN *the* LINES

"It was a train wreck in second grade — every input received my attention. But when I'm alpine climbing, that keeps me alive."

—CONRAD ANKER ON LIVING WITH ADHD, PAGE 60

feedback

Have Budget Will Travel

It's amusing to salivate over trip-of-a-lifetime lists, but not every month ("This Is How You Do It"). How about some attainable options in North America — biking, paddling, hiking, backpacking, and climbing trips geared toward weekend warriors that average people with average incomes can aspire to?

KASEY CORNWELL
PELRAH
Online

Looming Opportunity

Synthetics have become the dominant force in outdoor clothing, but as your article on Voormi showed, modern wool fabrics are chipping away at their armor ("Hooded Crusader"). For those who support not just American innovation but American jobs, companies like Colorado-based Voormi clearly

have a place in our closets and culture.

CLAY E. EWING
Wimberley, Texas

Voormi was founded on a great idea, but the price tag on their hoodie isn't helping our small mountain-town economy. If they wanted to benefit us more, they'd make it way less than \$230.

HANNAH B. GILES
Gunnison, Colorado

Taking Shots

You can't blame people for jumping on the Instagram bandwagon and getting sponsored to pursue their sport ("Pics or It Didn't Happen"). I don't follow Jimmy Chin or Kalen Thorien, but I often wonder how on earth the photographers set these shots up and keep themselves safe.

KATHY COLMAN
San Jose, California

Harry Borden

Borden, who photographed snow-safety evangelist Manuel Genswein on the slopes of the Alps for "Avalanche Rescue Needs a Revolutionary" (page 68), is just as well known for his work in the studio, including some of the most memorable portraits ever taken of Margaret Thatcher and Gillian Anderson. But traveling to Switzerland gave the London photographer an opportunity to capture Genswein in his element. "I prefer to shoot people in their own environment, and Manuel is absolutely at home on the mountain," Borden says. "If his face was the first face you saw after being buried in an avalanche, you'd think he was an angel."



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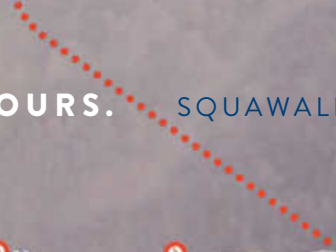
Rene Ebersole

Ebersole, an editor at *Audubon* magazine, studied ecology before applying to the master's program in science, health, and environmental reporting at NYU. "I wanted to branch off from science and focus more on storytelling," says Ebersole, who lives in Ossining, New York. "The program was built on the idea that it's much easier to take people who understand science and teach them to write than it is to

take a bunch of writers and try to teach them about science." In "You're Not Dead Until You're Warm and Dead" (page 54), Ebersole drills down on the therapeutic potential of hypothermia. "The resilience of the human body is totally amazing," she says. "I'd read about people who didn't have a heartbeat for as much as seven hours and then were revived. I wanted to give those stories a closer look."



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BETWEEN *the* LINES



Mountain Man

Devon O'Neil, who got to know renowned Swiss avalanche expert Manuel Genswein for

"Avalanche Rescue Needs a Revolutionary" (page 68), first had his byline in the magazine when he profiled skier Rainer Hertrich (above).

The Breckenridge, Colorado, writer has since coauthored Hertrich's memoir, *The Longest Run: How a Colorado Ski Bum Skied Every Day for More Than Eight Years*. Considered the Cal Ripken Jr. of skiing, Hertrich set the record for the most consecutive days on the slopes in 2012, having come close to quitting about 25 times. As he told O'Neil in 2006, "I either felt like shit, I knew the snow would suck, or it was cold as hell."

Go With Us

To kick off the new year, Outside GO's travel experts have compiled a list of the ten best trips of 2016—with hiking, surfing, and safari packages touching down in Scotland, Australia, and everywhere in between. Learn more at outsidego.com/2016.

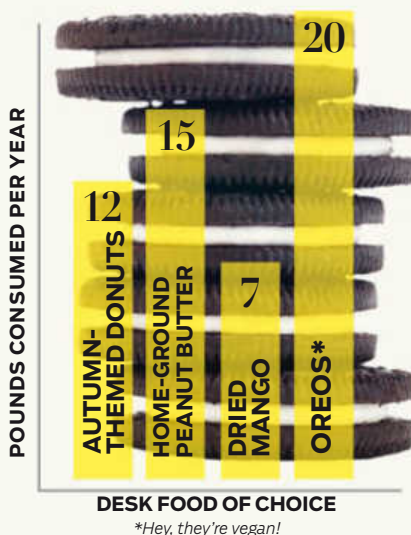


JON BILLMAN

Billman had trouble believing his ears when he heard that his hero, retirement-aged mountain biker Ned Overend, had taken first place at the most recent Fat Bike Birkie in Cable, Wisconsin. "I kept asking, 'Ned who?'" the Michigan-based writer says. "That guy must be in his sixties!" For "60 Is the New 25" (page 88), Billman visited Overend's adopted hometown of Durango, Colorado, stopping at a local restaurant where the dining room—yes, the actual dining room—is part of the course for the annual Iron Horse Classic bike race. "It's entirely possible that Ned has ridden past pictures of himself that are up behind the bar," he says. "He should be the mayor of Durango."

Found in the Editors' Offices

Notwithstanding Tim Zimmermann's comprehensive look at the modern meal in "Eating Right Can Save the World" (page 78), the ideal diet remains elusive—even for our own staff.



THE WOODSHED

In the November issue, "Grand Central" misidentified whale sharks as mammals. They are fish. And "This is How You Do It" incorrectly stated that Chamonix, the French mountain town, is in Switzerland. In December, "Hello, I Must Be Going" misspelled the name of Kewaskum, Wisconsin. And "It's In the Bag" listed the GoTenna's range as 50 miles. That's the theoretical maximum; the practical distance in the field is up to five miles.

outsideonline.com/theoryofeverything

ONLINE EXTRAS

Following up on this month's Theory of Everything (page 53), Outside Online offers an expanded look at the science and research transforming the world of adventure. Learn once and for all why bikes have four-digit price tags (hint: gear is much better than it used to be), and listen to exclusive field recordings by Bernie Krause, a sound engineer who is altering our understanding of climate change.





Digg In

On November 13, "badass marine biologist" Sylvia Earle (above) was featured in a Digg Dialog on the news aggregator's site, answering questions about ocean plastic, closed-system aquaculture, and the corrosive influence of the vernacular.



Laura Blom

Sylvia, at some point will we have to stop using the expression, "There are plenty more fish in the sea"?

Digg 3 Reply ***



Sylvia A. Earle Marine Biologist

We should stop right now!

Digg 4 Reply ***



What We're Watching

In January, Outside Television will premiere *In Search of Speed*, an eight-part documentary series that follows America's most elite alpine racers, including Ted Ligety and Mikaela Shiffrin, through a World Cup season, traveling from Vail, Colorado, to Park City, Utah, and from Chile to Austria, as they attempt to rewrite skiing history. The series begins January 21 at 9 P.M. EST.

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DISPATCHES NEWS FROM THE FIELD



→ Under Armour athlete Tom Brady

FIRST LOOK
Tough Play
UNDER ARMOUR WANTS TO BE A MAJOR FORCE IN OUTDOOR APPAREL. CAN IT SUCCEED WHERE OTHER BIG BRANDS FAILED?
by Peter Vigneron

THE DISTINCTIVE UA logo of activewear brand Under Armour has been showing up in some unexpected places of late. The company, known for its affiliation with big-name athletes like Tom Brady and Stephen Curry (and crossover stars like Lindsey Vonn), recently sponsored trail runner Kyle Dietz and snowboarder John Jackson. It agreed to provide outerwear for employees at nine ski resorts in the U.S., including Killington and Deer Valley. It had a large booth at this year's Outdoor Retailer, the industry trade show in Salt Lake City. It even signed on to become **continued** →

TIM TADDER



Will play for lift. Sean Villanueva O'Driscoll in Joshua Tree National Park, California. **Ken Etzel** © 2016 Patagonia, Inc.

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DISPATCHES

the title sponsor of the ski- and snowboard-porn auteurs at Matchstick Productions, a move befitting its launch this winter of a modest line of top-end snow jackets, pants, and bibs.

In other words, the \$3 billion company isn't just about mainstream sports anymore. It's gunning for core consumers in the outdoor market. Of course, big brands have tried this before—Nike launched its ACG line of technical outerwear in 1989, and Adidas's mountain-specific Terrex line was introduced in 2011, but neither has taken over America's ski hills. That's partly because those businesses have struggled to find



The \$3 billion company isn't just about mainstream sports anymore. It's gunning for core consumers in the outdoor market.

a foothold in the kinds of boutique shops that, even in the digital age, dictate trends in the outdoor world.

Nevertheless, Under Armour plans to reach customers at these very outlets. "You're not going to see our outdoor products at sporting-goods stores or department stores," says Steve Metcalf, UA's director of marketing for outdoor apparel. Though it's targeting the places where serious athletes shop, the brand hopes

to distinguish itself in other ways, too.

While Nike and other apparel makers promote proprietary fabrics, Under Armour has partnered with companies already familiar to outdoor enthusiasts, such as Gore-Tex and Polartec. Kurt Gray, a longtime designer who has worked for Helly Hansen and the North Face, says UA has poached some of the most respected names in the business. "They have really solid people working

there," he says. That includes talent from Arc'teryx, Mountain Hardwear, and Patagonia.

The advent of online retail also means that a deep-pocketed company like Under Armour can spitball product lines until it discovers what works. Those kinds of market-research insights, says Metcalf, "are far more accessible now than they were a decade ago. We can test product styles, colors, and designs almost in real time."

Under Armour's biggest challenge may be overcoming a perceived lack of authenticity. Core consumers tend to reward companies whose founders—like Patagonia's Yvon Chouinard—have spent serious time in the mountains. (Under Armour's founder, Kevin Plank, played football at the University of Maryland.) "That may not matter to someone who's living in Manhattan and just wants a black down jacket," says Kate Rosso, co-owner of the Elephant's Perch, a gear shop in Ketchum, Idaho. "But for someone who's up at the ski hill or the crag every weekend, authenticity is important." That, in turn, makes it

difficult to convince independent shops—which Metcalf says are an important part of UA's business plan—to carry the brand in an already crowded marketplace.

Metcalf thinks the company will succeed in eroding all doubt. In 2016, Under Armour will relocate its outdoor division, currently in Baltimore, to a 64,000-foot building in downtown Portland, Oregon, placing its outdoor designers in a brand-bolstering locale. In March, it will launch a line of trail-running shoes and apparel. "Authenticity and innovation are how we've won every category we've been in," says Metcalf. "We'll do it in the outdoor market, too." **O**

CLOCKWISE FROM LEFT:

Lindsey Vonn; UA snowboarders John Jackson, Bjorn Leines, Dustin Craven, and Tanner Rainville

CLOCKWISE FROM LEFT: JAMES MICHELFELDER; AARON DODDS (3); JEFF CRICCO

Don't Be This Kook



I dared her to climb that rock face.

She bet me we couldn't bike 100 miles.

A guy at the bar said to get a Picon Punch cocktail.

I can't remember who said to try heli-skiing.

But man I'm glad we did.

Jenny & Mike, Adventurers
Lamoille Canyon

DON'T
FENCE
ME
IN

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A STATE APART.

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↑
Burnham in
London, 1901

MEDIA

The Most Interesting Man in the World

A ROLICKING NEW BOOK EXAMINES THE EXTRAORDINARY, NEARLY FORGOTTEN LIFE OF FREDERICK RUSSELL BURNHAM

by Jonah Ogles

ABOUT A THIRD of the way into *A Splendid Savage* (\$30, W. W. Norton), author Steve Kemper addresses the lure of gold rushes during the late 19th century by noting, "Sometimes reality matched imagination." The same is true of the book's subject, Frederick Russell Burnham, whose life was so full of derring-do and fearless exploits that, lacking historical record, one would assume him to be myth, more Man with No Name than Wyatt Earp. Burnham manages to make them both look like armchair cowboys.

He rode through an enemy camp of several thousand Ndebele warriors in an attempt to capture their king, was quickly surrounded, and escaped under cover of night.

During his teenage years in the 1870s, Burnham tracked the Apaches then fighting in the Arizona Territory. He once ran 22 miles over rugged terrain to deliver a message—and got there before a horseman who had left at the same time. Then he discovered enough gold in the Southwest to make him rich. Later, while traveling in what was then Rhodesia, he rode through an enemy camp of several

thousand Ndebele warriors in an attempt to capture their king, was quickly surrounded, and escaped under cover of night. His gold fever not yet cured, he joined the Yukon gold rush. All this before he turned 35. (He lived to be 86 and barely let up.)

Burnham's escapades make for easy storytelling, but Kemper's writing is steady and fun. About Burnham's time as a "messenger" for Wells Fargo wagons, Kemper writes, "The message was double-aught buckshot delivered from a sawed-off shotgun, a combination that could blow a window in a bandit." Kemper writes in awe of Burnham's skills as a scout, which were so well-known that he helped inspire the founding of the Boy Scouts of America and was asked to join Roosevelt's Rough Riders.

That's not to say that Kemper glosses over the man's imperfections. He was a racist, and his wife and his three children, whose births he missed, were often left alone. But one tends to skip over those parts in search of his great adventures, which are only occasionally interrupted by lengthy asides on subjects like the short-lived U.S. Army Camel Corps. Such digressions would be distracting were Kemper not so clearly having a good time writing about them, which makes the topics almost as fascinating as Burnham's life. Almost.

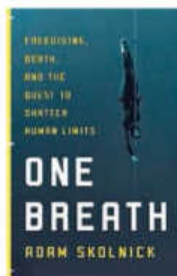
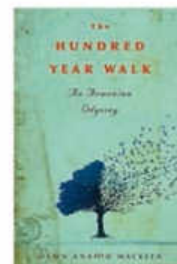


ALSO ON OUR NIGHTSTAND
Three Other Can't-Miss Books Out This Month

Breaking Wild, by Diane Les Becquets (\$26, Berkley)
A thriller about two women—one an elk hunter lost in northwest Colorado, the other a search-and-rescuer on her trail—and their fight against nature.

The Hundred-Year Walk, by Dawn Anahid MacKeen (\$24, Houghton Mifflin Harcourt)
The author retraces her grandfather's steps as he escaped Turkey during the Armenian genocide—and tells the story in gripping detail.

One Breath, by Adam Skolnick (\$26, Crown Archetype)
Skolnick goes deep with richly reported details about the life of freediver Nicholas Mevoli, who died after a record-setting attempt in 2013.



Don't Be This Kook →



"THE GRONK"

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DRINK

Dark Secret

SMALL-BATCH CHOCOLATIERS ARE LOOKING TO ANCIENT CIVILIZATIONS TO REVIVE A FORGOTTEN ELIXIR

by A. C. Shilton

MORE THAN A THOUSAND years ago, chocolate was consumed one way: Mesoamericans fermented and roasted cacao beans, ground them up, blended them with spices, added water, and whipped it into a thick froth. "It was very bitter," says Simran Sethi, author of *Bread, Wine, Chocolate: The Slow Loss of Foods We Love*. Though shops in Mexico and Europe have continued to offer similar, sweeter versions of sipping chocolate, Americans are only recently rediscovering its pleasures, thanks to the burgeoning chocolate movement.

"Chocolate is the new craft beer," says Todd Masonis, cofounder of Dandelion Chocolate in San Francisco. Like brewers, chocolatiers want to transform the whole industry, including the drinkable stuff. Shops and coffee bars around the country are now offering \$5-and-up glasses of sipping chocolate—both the thick, sweet, European-style drink, made with milk, and the more bitter, water-based Aztec- and Maya-style libations.

Part of the boost in popularity comes from studies that have explored chocolate's health benefits. Over the past several years, cocoa has been found to have more flavonoids—a type of antioxidant—than red wine or green tea, to lower blood pressure and bad cholesterol, and even to ease perceived soreness after a workout.

"There used to be chocolate houses on every corner," says Masonis. "Anyone who tries it can see that chocolate has the potential to rise again."

SPECTRUM

Sweet Talk

RUNNING DOWN JUST HOW CLOYING OR ACERBIC DRINKING CHOCOLATE CAN BE

WHERE TO INDULGE

In New York City, go to Mariebelle's Cacao Bar in SoHo, which offers 11 drinking chocolates. In Los Angeles, try the lavender-infused option at Demitasse. And in Portland, Oregon, get the tasting flight at Cacao.

SUGARY

Swiss Miss:

Hot-cocoa mix

Mexican

champurrado:

Masa flour mixed with dark Mexican chocolate, anise, and cinnamon.

Parisian

hot chocolate:

A mix of melted bittersweet with whole milk and a little sugar.

Chocolate

a la taza:

Thick enough to stand a churro in, bitter enough to complement its flavor.

Aztec hot

chocolate:

Cacao nibs coarsely ground with chile and other spices and mixed with water, not milk.

Cocoa tea:

Popular in Saint Lucia; made by steeping roasted cacao nibs and husks in water.

BITTER



PRIMER

High Fly in Center Field

THE GREATEST AERIALISTS IN SNOW SPORTS ARE COMING TO BOSTON'S BASEBALL CATHEDRAL

by Gordy Megroz

THIS FEBRUARY, Fenway Park's most distinctive structure won't be the Green Monster, the 37-foot-high left-field wall inside the 103-year-old home of the Boston Red Sox. It will be the 140-foot-high snow-covered ramp. On February 11 and 12, sixty of the world's best snowboarders and freeskiers—including Americans Sage Kotsenburg, the gold medalist in slopestyle snowboarding at the Sochi Olympics, and Joss Christensen, who took gold in the same event for skiers—will huck themselves off the incline before a crowd of 20,000 people (and an estimated million-plus viewers on the NBC Sports Network) during the big-air competition of the U.S. Grand Prix freeskiiing and snowboarding tour, which will make previous stops in Park City, Utah (halfpipe), and Mammoth Lakes, California (halfpipe and slopestyle). But before the athletes can vie for the podium, a team of specialists, engineers, and snowmakers will spend 24 days prepping the ramp.

THE PLAN

How to throw a wicked-smart big-air competition in a ballpark

1. Pregame

A week before the event, staff from Vermont's Killington Resort will generate a huge pile of snow near home plate. Then they'll use cranes to create a two-foot base on the approach ramp.

2. Big Papi

The snow will be groomed with a mammoth five-ton Prinoth snowcat—the first such machine to operate inside the stadium.

3. Higher Ground

An elevator inside the ramp's steel structure will transport athletes 140 feet to the starting gate.

4. Preparing for Liftoff

Athletes will descend 94 feet at approximately 35 miles per hour, hit the 13-foot-high jump, reach heights of 40 feet in the air, and land on another 38-degree, 225-foot-long ramp.

5. Going, Going, Gone!

To medal, skiers will likely throw 1440 triple corks (four rotations and three off-axis flips), forward and backward. Snowboarders should land 1620 triple corks (four and a half rotations and three off-axis flips).

Don't Be This Kook



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CROWDFUNDING

The Key to Their Olympic Dreams? Your Wallet.

THE LATEST TREND AMONG TOP-LEVEL ATHLETES IS GETTING FANS TO COVER THE COST OF COMPETING

by Gordy Megroz

IN 2013, AFTER eight years of early mornings training in freezing temperatures, Drew and Danny Duffy were named to the U.S. Ski Team. There was just one more hurdle to overcome before the brothers from Vermont could compete: come up with \$25,000 each for travel expenses for the season. The U.S. Alpine Ski Team, like most Olympic sports organizations, earns money primarily through fundraising and sponsorships, which often generate enough to cover travel for only its 20 or so top competitors.

To raise cash, the brothers turned to crowdfunding. While Kickstarter campaigns typically promise early versions of products or a share in the company, athlete endeavors offer perfunctory gifts like signed posters—or nothing at all. That doesn't keep donors from lining up. "They mostly just want to be a part of your story," says Drew Duffy, who raised \$52,000 in 60 days and won the U.S. Alpine Championships super-G title in 2015. "People like to see you succeed."

GoFundMe—used to raise money for everything from business ventures to medical expenses—began supporting athlete campaigns in 2010. Two years later, Craig Williamson, an entrepreneur from

New Zealand, founded Sportfunder, the first platform devoted to them. But it wasn't until Bill Kerig, a former pro skier, launched Rally-Me that year that online athletic cup rattling really took off. "Lindsey Van, the ski jumper, needed to raise money to compete in Sochi," says Kerig. "I said to her, 'If I build this, would you use it?'" She did, and more than 1,000 other athletes have since.

Kerig says several million dollars have been raised using the website over the past three years, and it has since signed up other U.S. national teams, including cycling, climbing, and track and field. Other sites are joining the game as well—Athlete.com, Dark Horse Pros, Dreamfuel.me, Makeachamp, and Pursu.it, to name a few. Many now employ a staff to help users reach their goals, whether it's advice on producing an enticing video or leveraging social-media followings.

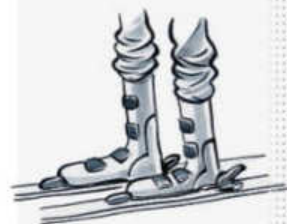
"The running community wants to connect with our athletes, and crowdfunding allows them to do that," says Tom Jackovic, executive director of the USA Track and Field Foundation.

Next up: bankrolling your next adventure. "We want to be there for any athlete," says Kerig. "If you hope to climb El Cap and need money to do it, we can help."

Don't
Be This
Kook



"THE GISELE"



"THE PANTALOOM"



"THE
LIGHTNING
ROD"



"THE DALLAS"



Running Down a Dream

Ultrarunner Errol “the Rocket” Jones’s quest for self-discovery on California’s Bay Area Ridge Trail

WHEN ERROL JONES was growing up on the South Side of Chicago in the 1950s and 60s, his mother used to tell him, “Everybody has a cross to bear. You bear yours.” It’s a philosophy that Jones took to heart, and it’s helped him endure dozens of ultramarathons over the last 35 years, including the Western States 100, Badwater Ultramarathon, and the Bear 100, which he co-directs. What’s more, “the Rocket” is best known on the trail for acting as a pacer by running alongside fellow competitors who are hitting the wall, coaching and cajoling them to stay in the race. “I try to get them to come to grips with what’s happening and know that this won’t last,” says Jones. “Just roll with it for a while and it will get better.”

After high school, Jones enlisted in the Army, and ended up serving a long stint in Vietnam. When he came home, he converted to veganism. The new diet did more than make him feel better; it spurred him to reinvent himself. In the mid-’70s, he decided to move to the Bay Area, where he thought his veganism would be more accepted. Around the same time, Jones also



discovered running. Before long, he was an accomplished marathoner. Then, in the early ’80s, he discovered ultra racing.

Since then, he has literally run tens of thousands of miles on the Bay Area Ridge Trail, the 365-mile-long multi-use route that connects more than 50 parks and open spaces in the Bay Area. Even at 66, Jones is out on the



trail nearly every day. Still, age is catching up with him. He’s hasn’t completed a 100-miler in four years. But he believes he still has one more big race in him and hopes to complete a 100-miler this year. “Believe me, I know it’s not over yet,” says Jones. “It’s who I am, and it makes me feel complete. I come to grips with all of my strengths and weaknesses through running.”

BAY AREA RIDGE TRAIL

Spanning 365 miles (it’ll be close to 550 when complete), this vibrant stretch of redwoods and wildflowers is a much-needed sanctuary for more than seven million Bay Area residents. The trail is open to hikers, mountain bikers, and equestrians, but its diverse terrain and panoramas make it a trail runner’s dream.

Every Trail Connects

REI believes that a life outdoors is a life well lived, and Errol’s story is the first of a three-part series dedicated to people deeply connected with trails. To watch a short film about Errol Jones and learn more about the Bay Area Ridge Trail, including the people working to protect and preserve it, please visit [REI.com/trails](https://www.rei.com/trails).



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Braving the 16-hour flight from Los Angeles to New Zealand is easy. The hard part? Sorting out the details. That's why we're here with 13 must-do adventures for your Kiwi checklist.

1

Make a Plan

The stars aligned. The grandparents agreed to take care of the kids, and my wife and I were free to fly. Two weeks, the two of us, New Zealand. But where to begin? My buddy Kyle scoffed when I asked him what the trip should include. "You need at least a month," he said. After I compiled a hit list of ideas, I started to think he was right. A couple of deep breaths and two fingers of bourbon later, I surfaced with some waypoints. We would focus our efforts on the South Island. We needed to see old friends in Nelson, on the northwest tip, and I had become obsessed with mountain biking around Wanaka and sea kayaking in Doubtful Sound, both in the southwest. Now all we needed to do was connect the dots. So we rented a camper van and plotted a road trip for mid-May—late fall in the Southern Hemisphere and New Zealand's shoulder season, when there are fewer crowds and everything is a bit cheaper. Our plan took more finagling than I anticipated, and compromises had to be made. (We missed the east side of the island entirely.) But we were able to linger as we poked

our way down the moody and rugged west coast, followed locals' advice on how to find unmarked beaches, spent a leisurely afternoon soaking in the pools on Franz Josef Glacier, and took a side trip to the Lake Hawea sheep station to see where our merino base layers come from. You may decide that a camper van isn't for you, and you might want every afternoon planned. That's OK, too. I felt a lot of emotions cruising around the South Island—mostly bliss and awe, with the occasional surge of terror when I forgot to drive on the left—but FOMO wasn't one of them. Yes, there's a lot to do in New Zealand, but you pretty much can't go wrong. —SAM MOULTON



NZ

through the overwhelming number of possibilities crammed into these two islands.

+

Lake Wakatipu
and the South-
ern Alps outside
Queenstown



2



1. Aro Ha 2. The view from Aro Ha 3. Your ride to Minaret Station 4. Pedaling Nga Haerenga

A LODGE FOR:

Unplugging

Retreats at Aro Ha, a two-year-old lodge set on 21 acres of wilderness in the Southern Alps, are less about indulgence and more about rebooting and connecting

with nature. A typical day starts with sunrise yoga followed by breakfast, then a three-to-four-hour hike and a well-earned (and healthy) lunch. Free time allows guests

to relax in their timber paneled rooms. In the afternoon, you can take a raw-cooking class; pre-dinner cocktails are replaced with more yoga. After dinner, head to the

spa for your daily massage and get your muscles ready to take on another day in the wild.

—JEN MURPHY

From \$3,125 for five days; aro-ha.com



2

3 Hire a Chopper

Because that's the only way to reach Minaret Station, a 50,000-acre working farm and adventure base in the heart of the Southern Alps. Last year the lodge replaced its original four tents with luxe chalets outfitted with private decks and hot tubs. Once you've been whisked the 20 minutes from Queenstown, you'll heli-ski deep chutes, fly-fish for sea trout where glacier-fed rivers meet the Tasman Sea, or picnic on barbecued crayfish on a beach in otherwise inaccessible Fjordland National Park. From \$1,300 per night, all-inclusive; \$1,200 for helicopter transfer; minaretstation.com —J.M.



3



4

FOUR

Mountain-Bike from Tip to Tail

New Zealand's transformation into one of the world's great mountain-biking destinations had an unlikely beginning: in 2008, some forward-thinking bureaucrats came up with a plan to build an off-road bike path that would run the length of the country. The New Zealand Cycle

Trail, known locally as Nga Haerenga—Maori for “the journeys”—launched in 2015. It's not a linear system but a collection of 23 segments that include everything from gravel to rugged single-track. Want to see a lot of it? Sign up for February's Pioneer, a seven-day supported stage race from

Christchurch to Queenstown (\$3,335 for two; thepioneer.co.nz). Or take a two-week trip with UK outfitter H&I Adventures (from \$3,910; mountainbikeworldwide.com). Owner Euan Wilson says the network inspired his new Kiwi excursions. “It's going to blow people away,” he says. —AARON GULLEY

- 1. A ridge-line above Christchurch
- 2. C1 Espresso
- 3. The Little River PurePod
- 4-5. Oyster Inn



5

Explore the New Christchurch

An earthquake devastated Christchurch five years ago, but it also gave this South Island city of 367,000 good reason to reinvent itself as a gateway to the surrounding wilds. Orient yourself with the two-hour Christ-

church Rebuild Bike Tour (\$50; chchbike.tours.co.nz), which showcases Shigeru Ban's Cardboard Cathedral (yes, it's made out of paper) and Re:Start, an architecturally striking mall made from repurposed

shipping containers that features local food and designers. Then settle in for a late lunch at C1 Espresso, where southern—as in North Carolina—fried chicken is delivered via a pneumatic tube, like in a bank drive-through.

Let the food settle on a 35-mile drive south to the town of Little River: you're headed to the PurePod, a tiny glass-walled cabin, for a night of stargazing (\$326; purepods.com). —STEPHANIE PEARSON

SEVEN Consider the Glowworms

But maybe don't go see them. The same holds for a lot of classic New Zealand thrill-seeking activities. The country is packed with adrenaline junkies, and it's hard to escape places to bungee-jump, jet-boat, skydive, and so on. Now, I've got nothing against getting scared silly, but it was easy to pass on most of that stuff—it all felt a little Las Vegas. Deciding whether or not to see the famed glowworms was a tougher call. These particular mosquito-size bugs, technically maggots of a fungus gnat, grow only in New Zealand. When conditions are right, they gather in caves to produce an eerie blue-green glow, luring tourists across the country. They're also Instagram gold. I worried that the experience would be canned and hokey, and the adventure gods must have sensed my ambivalence: when my wife and I arrived, the river was too high to reach the cave. So we went to the Tasman Sea and watched some fur seals. It was mellow, serene, and just what we were looking for. —S.M.



6 A LODGE FOR: Food Lovers

Auckland locals take the 35-minute ferry ride to Waiheke just for a meal at the Oyster Inn. The restaurant has a buzzy, Montauk-in-the-Southern-Hemisphere feel. Local gardeners grow the restaurant's vegetables, fisherman Terry Gallon brings in the day's catch, and oysters are grown on the island and shucked to order at the bar. The menu changes daily, providing another reason to stick around and book one of the three minimalist rooms. Oneroa Beach is a short walk away, and a little farther are wineries, olive-oil producers, and spots to launch a sea-kayaking or saltwater-fly-fishing expedition. The food is just as good at breakfast, which is available only to overnight guests. —J.M.

From \$195; theoysterinn.co.nz —J.M.



8

A LODGE FOR:

Families

Sherwood, Queens-town's newest eco-retreat, feels like a grown-up summer camp. Send the kids out on one of New Zealand's only dual-salom mountain-bike courses, then

take a workshop on fermented foods or biodynamic wine. In the garden, guests can help harvest fare for the restaurant's delicious organic dishes, served overlooking Lake Wakatipu. There's a shared bunk room in the

newly renovated lodge, but if that's taking the camp vibe too far, a two-bedroom suite runs less than \$200 per night. —J.M.

Bunks from \$60, private rooms from \$130; sherwood queenstown.nz



1



2



3



4



5



1–5. The Sherwood
6. Running the Buller River

9

Kill Any Rodents You See

Don't come to New Zealand if you're looking for cute and fluffy. This otherwise peaceful nation is entrenched in a campaign to rid itself of anything with fur. The islands have virtually no native mammals, but when early settlers arrived they introduced possums, weasels, and rats that thrived at the expense of native birds. And recently things have gotten personal: the portly, flightless kiwi that New Zealanders claim as their national icon is losing up to 95 percent of chicks largely to invasive species. Now the nation is clearing the predators from offshore islands to create refuges for native birds, and even nature lovers are getting in on the action. Herb Christophers, a spokesman for the New Zealand Department of Conservation, proudly introduced a device under development that will lure pests with bait and spray them with a toxin. "Doing nothing is not an option," he says. —CHENEY GARDNER

TEN

Run the South Island's Rivers

Nearly 400 inches of rain per year produces some of the greatest whitewater on the planet. Stop by the New Zealand Kayak School in Murchison to rent a boat and get the latest river conditions (\$45 per day; nzkayakschool.com). —S.P.

♦ The Class II–III Mararoa River, south of Queens-town, winds four lazy miles through an otherworldly beech forest before hitting a narrow gorge with Class III rapids.

♦ The Buller, which Kiwi paddling expert Graham Charles calls "simply the greatest kayaking river in the country," has long Class III wave trains that are suitable for experienced SUPers.

♦ Kokatahi's eight-mile stretch of Class IV–V rapids require a helicopter shuttle (and an excess of courage) to run the holes and drops in the turquoise churn of Carnage Gorge.



6

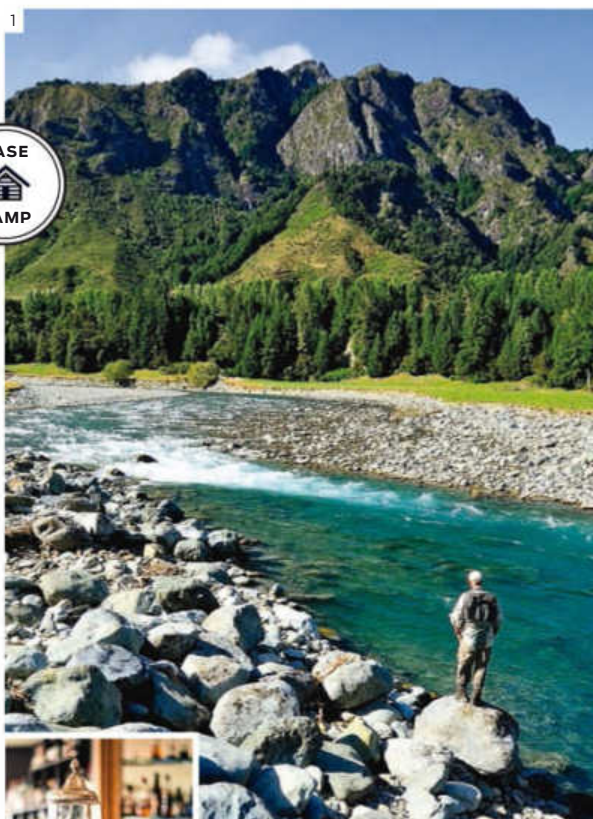
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A LODGE FOR:

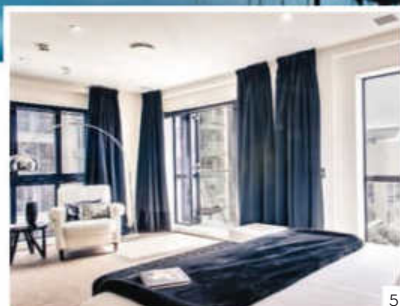
Anglers

The north side of the South Island has some of the best sighted river fishing on the planet, and Owen River Lodge, 90 minutes from Nelson, is in the middle of it all. Owner Felix Borenstein is a fanatical fisherman with discerning tastes, and he chose the location for its diversity of water, from small spring creeks to large freestone streams with monster fish. The lodge can also arrange heli-fishing trips into Kahurangi National Park, where giant browns eagerly attack dry flies. In the evening, swap tall tales during a nightly four-course dinner washed down with plenty of sauvignon blanc from the neighboring town of Marlborough. —J.M.

From \$400; owenriverlodge.co.nz



13



1. Fishing near Owen River Lodge
2. Camper vans on a back road
3. Wellington Harbor
4. The bar at Museum Art Hotel
5. A Museum Art suite

Stay in Town

Think of Wellington, a city of 204,000 at the bottom of the North Island, as the Southern Hemisphere's San Francisco. Like that other bay city, there are world-class museums—like the Te Papa's Maori collection—and a waterfront teeming with sailboats, rowing sculls, and SUPs. Wellington also has endless hiking, trail-running, and mountain-biking options. For a taste of its impressively varied terrain, stay at the Museum Art Hotel on the waterfront next to the Te Papa (\$159; museumhotel.co.nz), then hike the seven-mile Southern Walkway, which traverses high points Mount Victoria and Mount Albert. Back in the city, get grilled fish of the day at Whitebait, an elegant waterfront spot on Clyde Quay Wharf. —S.P.



TWELVE Go All In

In college, I was studying to be a vintner and skipped a term to intern at a winery on Waiheke, an island near Auckland. During an eventful first week, I weed-whacked the cork tree saplings in the winery's decorative orchard (oops), hooked up with a coworker in the boss's bed (ditto), and boxed with a local in a bar (just dumb). It was clear that I wasn't cut out for wine-making. So I made for the North Island and bought a van. Auckland's car market is filled with international travelers pawning used camper vans for cheap. I paid \$1,500 for a spray-painted Mitsubishi named Humbug and pointed it south. At the adventure hub of Rotorua, I kayaked 12-foot waterfalls on the Class IV Kaituna and rock-climbed above the shores of Tahoe-like Lake Taupo. Then I hopped a ferry and spent three months on the South Island, where I shared Humbug with a Dutch girl and a Swede headed in the same direction. We harvested green mussels from the bleached beaches of Tasman Able National Park and hiked fjords on the 52-mile Dusky Track in the deep south. Thanks-giving was in the beech forests beneath 9,950-foot Mount Aspiring. After putting a couple thousand miles on the odometer, it was time to go home. So I sold Humbug for exactly what I paid for it. —KYLE DICKMAN



ADVENTURE BETA

Hut, Hut!

Everything you need to know to crash in the backcountry (in a good way)

BY PETER VIGNERON



- +
1. Bill Putnam
 2. Broome Hut
 3. San Antonio

THE THING ABOUT out-of-bounds skiing is that the best untouched lines tend to be deep in the woods. Getting to them takes time, and that's time you're not making turns. Which is why we love huts: book one and you'll spend the night where the snow falls without freezing in a tent. And sometimes the snow falls a lot. Waking up after a massive storm and knowing that you're already there—no 4 A.M. alarm, no loading the car, no waiting in lift lines—is Christmas morning for ski loons.

No 1

British Columbia

♦ Alpine Canada operates 23 winter huts, but its crown jewel is heli-accessed Bill Putnam (also known as Fairy Meadow), which offers a staggering variety of terrain. It's popular, so be prepared to apply for a lottery the spring before your trip.

\$1,000 per week including helicopter shuttle; alpineclubofcanada.ca

No 2

Oregon

♦ At Camp Norway, in the underrated Wallowa Mountains of northeast Oregon, you can choose between guided-and-catered or do-it-yourself options. Opened in 1980, the double-decker yurt offers access to advanced big-mountain lines.

From \$50; wallowhuts.com

No 3

California

♦ Built in 1936, the San Antonio Ski Hut puts skiers within a short tour of Mount Baldy's summit, two hours northeast of Los Angeles in the San Gabriel Mountains. It's operated by the local Sierra Club, and overnight lodging is just \$15 for members.

From \$15; angeles.sierraclub.org

No 4

Colorado

♦ Owned by the Grand Huts Association but part of the famous 10th Mountain system in Colorado, the solar-powered Broome Hut recently opened under steep, above-tree-line terrain that sees 500 inches of snow a year. It's just a mile from Highway 40 near Berthoud Pass.

From \$35; huts.org

Tips and Tricks

Because backcountry missions are a little more complicated than riding lifts



Book It:

These huts fill up quickly, so be prepared to reserve well in advance. You can usually find a single spot, but we recommend rounding up a crew of friends and booking the entire thing.



Get There:

Most North American huts are ski-to only, and Colorado's 10th Mountain system even enforces a non-motorized zone. For a lot less work on the way in, some huts offer helicopter access, like British Columbia's Kokanee Glacier and Alaska's Snowbird.



Travel Light:

Skinning with a heavy pack sucks. Many huts provide bedding, so check in advance to find out whether you can ditch your sleeping bag. Booze should have a high alcohol-to-volume ratio—so no to wine, yes to whiskey.



Stay Safe:

It's backcountry skiing, so bring the required safety gear—beacon, shovel, and probe—and practice using it before your trip. The remoteness that makes all this worthwhile also means you'll be the first responder in the event of an avalanche or injury.



Get Fed:

Some full-services huts, like Opus outside Silverton, Colorado, offer catered meals. It beats having to cook for yourself after a long day lapping pillow lines and also saves you from hauling in your own grub.

Hello Tomorrow



Be there to touch the unknown

The world invites you to countless experiences.
Make them your own. Fly Emirates to over
140 global destinations and you'll see that
nothing beats being there.

emirates.com/us

53 destinations in Asia • 22 destinations in Africa • 7 destinations in Australasia

essentials

PowderJet lets you **customize your own board**, choosing from a variety of nose and tail shapes (\$595). You can also build it yourself during a hands-on weekend at the company's headquarters in southern Maine (\$695).

WANTED Eastern Mountain Flyer

A BACKCOUNTRY
PLANK HANDMADE
IN NEW ENGLAND

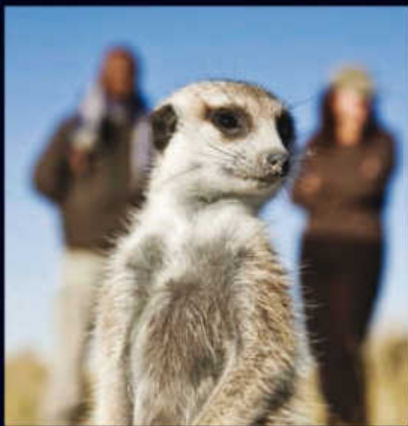
by **Graham Averill**

IN 2009, Vermont carpenter Jesse Loomis was frustrated. He wanted a snowboard that could handle the powder of his state's steep, open fields and tight trees—the terrain he grew up riding to get away from skier-clogged resorts. But he couldn't find one on the market that fit his needs. "With very few exceptions," Loomis says, "most were variations on the classic popsicle-stick shape, designed by and large for park riding."

What he needed was a board with rocker, for speed and float over deep stashes, but enough sidecut for hard carving and a flexible body that afforded plenty of control. So Loomis set about crafting it himself. His creation, the PowderJet Gypsy, features a notched tail and pointed nose more reminiscent of the guns that made big-wave surfing all the rage in the sixties than anything you'll find at a local winter-sports shop. Six years later, Loomis has gone full time and moved his tiny operation to the coast of Maine, where he churns out 65 PowderJets a year. He still personally hand-shapes each one, using North American-grown, Forest Stewardship Council-certified poplar for the topsheet. He then laminates it with bio-resin, a "super sap" byproduct of biofuel production, before sanding and finishing with urethane, which adds durability and protects the board's wood-grain look. The result is a deck worthy of envy-inducing Instagram hero shots when you're not using it to cruise around off-piste. \$550; powderjets.com

PowderJet

THE 100 ULTIMATE TRIPS OF A LIFETIME



OutsideGO

COMING SOON IN 2016 AT THE NEW OUTSIDE.GO.COM

essentials

outer layers



The Mountain Ops was built rugged for down-and-dirty jobs in the cold, but **fleece-lined pockets** provide comfort for numb digits.

STRESS TESTED Birds of a Different Feather

STAY WARM IN ALL KINDS OF CONDITIONS WITH THESE VERSATILE DOWN-ALTERNATIVE OUTER AND MIDLAYERS by Peter Koch



BEST FOR:

Snowshoeing Hurricane Ridge
The North Face FuseForm Insulated Dot Matrix \$299

The only truly waterproof jacket here, the Dot Matrix offers optimal protection against soggy Pacific Northwest winters. Its HyVent shell easily repels water, and PrimaLoft Silver Eco fill doesn't wet out in the rain. Pit zips and FuseForm construction—which integrates strong nylon in high-wear zones and breathable polyester through the torso—help keep you dry, too. thenorthface.com



BEST FOR:

Taking On All Tasks
Westcomb Tango Hoody \$300

The Canadian-built Tango may be outwardly unassuming—it's preposterously thin, is short on flashy doodads, and has just two pockets—but the combination of breathable Polartec Alpha insulation and a weather-shedding Pertex shell makes it ideal for a host of cold-weather pursuits. This hoodie is perfect paired with a base layer for trail running or worn under a hard shell for off-piste charging. westcomb.com



BEST FOR:

Fast and Light Ascents
Arc'teryx Nuclei AR \$399

You don't have to trade warmth for low weight on your next alpine epic. Arc'teryx stripped away superfluous pockets and adjusters from this seam-taped belay parka, leaving behind a windproof, water-resistant storm shelter that weighs less than a pound and packs into a Nalgene-size stuff sack. Inside, 100 grams of Coreloft insulation will keep you toasty even during the coldest, wettest bivvy. arcteryx.com



BEST FOR:

Reorganizing the Gear Shed
Eddie Bauer Mountain Ops \$249

While most winter jackets are designed for playing in the snow, this resilient layer is made for getting work done. The tough-as-nails 500-denier Cordura fabric is water-resistant, but it really shines in the face of serious effort—like repairing a snowblower or clearing brush. PrimaLoft Silver Hi-Loft insulation traps plenty of body heat, and articulated elbows open up your ax swing. eddiebauer.com

**BEST FOR:**

Big Moves, from Backcountry to Crag
Eider Pace \$300

This refined active layer is meant to be worn all day, from dawn patrol straight through to post-climb beers. The stretchy, DWR-coated ripstop shell works in tandem with PrimaLoft's 60-gram Silver 4Flex insulation to move and breathe like your favorite fleece, but with the warmth and protection of a down jacket. Wear it ski touring or on any intensely aerobic stop-and-go outing. eider.com

**BEST FOR:**

Boosting Heat on the Chairlift
Columbia Microcell Hooded \$200

Like other synthetic puffies, this one keeps insulating when it's wet. But Columbia's Omni-Heat lining reflects warmth back at the wearer's body, so it keeps your temperature up even as the mercury drops. Sport the Microcell around town, layer it under a hard shell, or pack it down to the size of a football and toss it in your go bag for a lightweight insurance policy. columbia.com

**BEST FOR:**

Besting a Down Puffy
Montane Hi-Q Luxe \$239

The Hi-Q is made for big-mountain missions in wild weather. It's stuffed with Gold Luxe, PrimaLoft's best synthetic fill yet: it's nearly as lightweight, warm, and packable as down but still insulates when soaked and dries much faster. Storm-ready features include a baffled zipper flap and an insulated hood that can be rolled and stowed once conditions improve. montane.co.uk

**BEST FOR:**

Keeping Warm, Sustainably
Icebreaker MerinoLoft Stratus Long Sleeve Zip Hood \$300

Being eco-friendly doesn't have to mean settling for second-rate insulation. Icebreaker's warmest jacket to date packs a 180-gram, water-resistant, recycled-merino blend into a 100 percent recycled-polyester shell. You could make this sharp-looking, weather-shedding hoodie your outer layer, but on winter hikes we like it as a midlayer offering extra protection. icebreaker.com

46%

The price increase of 900-fill goose down over the past seven years, from \$55 per pound to \$80. Synthetic and wool insulations are cheaper to produce, and their heat retention is catching up to that of down, resulting in more-affordable jackets for the budget conscious.



The Tikka Plus has a **constant lighting feature** that ensures consistent beam strength until the batteries are completely dead, instead of the usual slow fade to black.

7. Vasque Arrowhead UltraDry boots \$170

The 200 grams of Thinsulate insulation in Vasque's svelte, waterproof winter hiker provides tons of warmth without much bulk. And the speed-lace system is easy to manipulate with cold hands. vasque.com

8. MSR Lightning Explore snowshoes \$260

The ratcheting straps on these four-pound platforms are exceptionally easy to cinch down, and the frame and crampons provide excellent traction for heading uphill through the deepest powder. cascadedesigns.com

9. Mountain Hardwear Ratio 15 sleeping bag \$260

This 650-fill down sleeping bag compresses to the size of a camping pillow and weighs only 2.5 pounds, yet it provides enough warmth for chilly nights after the fire is out. mountainhardwear.com

10. Petzl Tikka Plus headlamp \$40

Petzl packed 160 lumens into the three-ounce Tikka Plus. It features a white light setting for normal visibility and a softer red one for moving about without waking your bunkmates. petzl.com

11. Glerups AG-01 slippers \$135

These 100 percent wool booties will keep your feet comfy and warm while lounging around the cabin. They also have durable rubber soles for outdoor wear, so you can slip them on for midnight pee runs. glerupsusa.com

UPGRADE Cabin Fever

ELEVEN MUST-HAVES FOR ANY HUT TRIP
by Jakob Schiller

1. Jetboil MicroMo cooking system \$130

Tiny but powerful, this stove weighs a mere 12 ounces, packs into its own container, and can boil two cups of water in just over two minutes. Pair it with the Pot Support (\$9) and it will also fry up a pan of eggs and bacon. jetboil.com

2. PackTowl Personal towel \$10

Crafted from a blend of polyester and nylon, the compact Personal soaks up four times

its weight in moisture, then wrings out nearly bone dry—perfect for wiping down everything from damp equipment to dishes. cascadedesigns.com

3. Bernzomatic 3-in-1 Outdoor Micro torch \$35

Sure, matches are great. But for those times when you need serious firepower, the Micro torch produces a concentrated flame that will have your woodstove roaring in minutes. The heated blade attachment lets you cut lengths of rope

for rapid gear-repair jobs in the field. bernzomatic.com

4. Goal Zero Sherpa 100 Power Pack and AC Inverter \$400

With 98 watt-hours of juice, the Sherpa 100 can easily charge all your devices—phone, tablet, laptop, Bluetooth speaker, GPS, and DSLR. When the power runs out, refill the portable battery with Goal Zero's über-packable Nomad 13 solar panel (\$160). goalzero.com

5. Black Diamond Alpine FLZ trekking poles \$140

Folded down, these 1.3-pound aluminum sticks disappear in your pack. Bonus: switch baskets and they're your summer trekking poles. blackdiamondequipment.com

6. Bobble Presse coffee brewer \$30

This compact metal French-press-and-cup combination delivers your morning boost faster and easier. waterbobble.com



Bellroy's Phone Case 3 Card (\$65; bellroy.com) holds only the necessities: your iPhone, three cards, and cash. That's all you really need.

OUTFITTED Slope Style

STAY WARM, LOOK COOL
by Jon Gugala

1. When it comes to denim, cut is everything. That's why we're fans of **Duer's L2X Slim Fit jeans** (\$129; dishandduer.com). Blended with a touch of Lycra for nonconstricting stretch, they're way more comfortable than fancy selvage.
2. The **Icebreaker Spire cardigan** (\$250; icebreaker.com) is woven from a cushy merino and acrylic blend, great for lounging fireside or on the lodge deck.
3. Your feet have been jammed into clammy ski boots all day. Give them a break with **Stance's Grainer socks** (\$14; stance.com). The smooth, combed cotton feels like silk compared with thick wool.
4. The **Will Leather Goods Gunner belt** (\$35; willleathergoods.com) has a tight weave that all but guarantees a snug waistline, and it comes in 13 colors, so you can add pop to otherwise muted winter duds.
5. **Corridor's Blanket Plaid shirt** (\$225; corridornyc.com) is made from organic cotton that's as warm as your favorite flannel bedding. The tailored fit ensures you won't look like you pulled it from Grandpa's closet.
6. **Shinola's Runwell Contrast Chrono 47mm watch** (\$800; shinola.com) tells time with style. Made in Detroit, it has a stainless-steel case with topaz plating for a sleek look.
7. Top your après kit with a crazy-warm piece like the 800-fill **Fjällräven Keb Down jacket** (\$650; fjallraven.us). It's our favorite outer layer for frigid days, thanks to the adjustable hood and stretchy cuffs.
8. When the slush gets deep, reach for **Bogs' Carson boots** (\$120; bogsfootwear.com). Rubber uppers shed water, and neoprene insulation keeps toes warm down to 14 degrees.

LOWDOWN Curated Content

UPSTART COMPANIES ARE OFFERING SUBSCRIPTIONS FOR PRIMO BOXES OF HAND-SELECTED GEAR

by Joe Jackson

A. KinderBox

\$35 PER MONTH

KinderBox casts a wide net with its minimum five monthly products, from EDC knives to shave cream to beer coozies. And since no case contains two items from the same category, you won't get stuck with a pile of jerky.

THE VERDICT:

A well-rounded pick for do-it-all outdoorsmen. thekinderbox.com

B. BivySak

\$75 PER QUARTER

All the gear in one BivySak box would cost up to \$120 if you bought everything separately. The company starts with a premium item like a Salomon Trail 20 pack and builds around it with offerings like a Nalgene bottle and hand warmers.

THE VERDICT:

Hardcore, quality gear on the cheap. bivysak.com

C. The Feed

\$49 PER MONTH

The Feed appeals to athletes at their core—the stomach. With six packages fit to individual sports, these boxes contain calories to keep you moving. If you're the hands-on type, pick out each item for a custom delivery.

THE VERDICT:

Fuel for breaking out of your energy-bar rut. thefeed.com

D. Isle Box

\$45 PER MONTH.

\$125 PER SEASON

Isle Box scouts the best brands that you won't yet find in stores. But it also teams up with trusted companies like Cascade Designs and Princeton Tec to deliver high-end goods like an MSR Responder Snow Science and Rescue shovel.

THE VERDICT:

The perfect mix of classic and cutting-edge. islebox.com

E. Serebox

\$59 PER MONTH

Serebox sends packages focused on different aspects of survival—food, fire, shelter, water, and self-defense. The offerings, like a waterproof first-aid kit, aren't flashy; they're simply what you might need to make it through the next snowpocalypse.

THE VERDICT:

Loaded with practical disaster tools. serebox.com



essentials

adventure tools, tested & reviewed



The Importance of Play

Having fun with your friends is just the start. New studies show that playing more often can do everything from boost creativity to improve relationships.

Everybody from psychologists to neuroscientists now agrees that play can relieve stress, increase happiness, and help us better bond with friends and family. The best part? Play works across ages, genders, races, and even species—consider how we play with our dogs—to bring us together. Here are five surefire ways to inject more play into your life.

1. Play, Don't Compete

You can't play with a purpose and call it play, according to Stuart Brown, the head of the National Institute of Play and part-time professor at Stanford. That means no winners, no losers, and no one keeping score. Rather than seeing who can climb to the top fastest or catch the most air off that kicker, strive to get everyone in your group to the top or catching air. **KEY TO SUCCESS:** If everyone in the group succeeds, that's play.

2. Playtime Is Anytime

Play is not the sole domain of big-time excursions on the weekends, or vacations. It can happen tonight, right outside your door. Grab a ball and play catch with your kids—or the neighbor. Climb the tree in the front yard. Camp out in the back yard. Get outside and go. In grade school, this was called recess. Today, cheap, simple, short, and

spontaneous activities like impromptu hikes or camp-outs go by the trendy term “micro-adventure.” It doesn't matter what you call it, as long as you go. **KEY TO SUCCESS:** Don't plan it.

3. Get in the Flow

When we play really hard, be it an intense game of Ultimate Frisbee or running up a steep mountain, we can reach what psychologists call a flow state. The feeling goes by different names—runner's high, being in the zone—but whatever you call it, it's essentially concentration so deep that you don't realize you're concentrating. And not only can it be really fun in the moment, it can also be really beneficial in the long term. According to psychologists, when we focus so intently on the task at hand, the rest of our daily concerns and distractions—mortgage, work, love life—fall away. Generally speaking, the more you flow, the better you feel, especially afterwards, when people report being more relaxed, satisfied, and confident. **KEY TO SUCCESS:** Flow states don't come easily, but pursuing them can be nearly as gratifying as reaching them.

4. Scare Yourself

This might seem counterintuitive at first, but think about why you enjoy riding giant roller coasters so much. It's the same reason we seek out double black diamond ski runs, Class IV whitewater, and technical mountain bike trails. There's no rational reason for

anyone to do any of these things, yet the adrenaline rush and confidence boost are undeniable. It's playing—on steroids—and if you do these things with friends, and help and encourage one another, the benefits are endless. **KEY TO SUCCESS:** Butterflies in the stomach and sweaty palms are okay; just make sure you don't succumb to so-called Kodak courage.

5. Go Big for No Reason at All

Plan something epic: chase fresh powder days over a long weekend, bike to your relatives' place for the holidays, canoe down the length of a river to see if you can, affix a three-story rope swing over a lake—you get the idea. **KEY TO SUCCESS:** Having no rational answer to the question “What's the point?” is the very definition of play.

THE 2016 TOYOTA TACOMA

A bold new look, a ton of new features, and more fun than ever before: everything about the 2016 Toyota Tacoma is designed for serious play. Whether you're conquering mountains or plowing through deserts, the Tacoma will get you in—and out of—just about any adventure. So many adventures that we even created this door hanger for you. Okay, enough talk, time to play.



Let's
Go
Places

PUNCH OUT
CIRCLE

**Sorry,
I'm still out
playing.**



**THE ALL-NEW
TACOMA**



**Let's
Go
Places**

Prototype shown with options. Production model may vary.

PUNCH OUT
CIRCLE

**Sorry,
I'm out
playing.**

THE ALL-NEW
TACOMA



Let's
Go
Places

Professional drivers on closed course. Do not attempt.



Let's
Go
Places

PLAY NOW

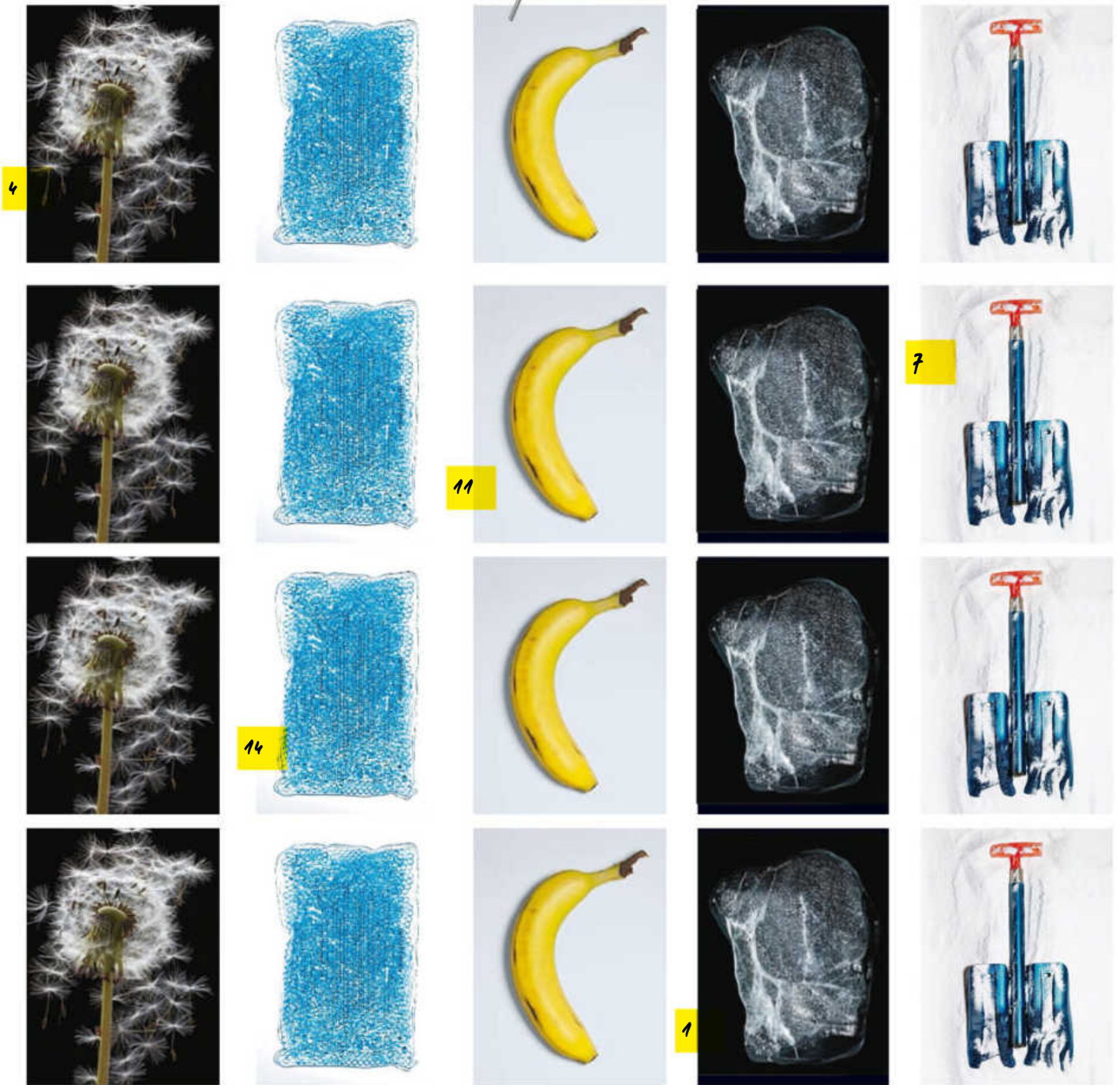


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THE ALL-NEW
TACOMA

THE THEORY of *outside Magazine* 01/02.16 EVERYTHING



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YOU'RE NOT YOU'RE WARM

Amazing stories of animals and humans surviving extreme cold are fueling futuristic research that verges on sci-fi. A deep dive into the DNA of icy wood frogs, a novel approach to cardiac arrest, the potential for cryopreservation, and other shocking developments from the new science of freezing.

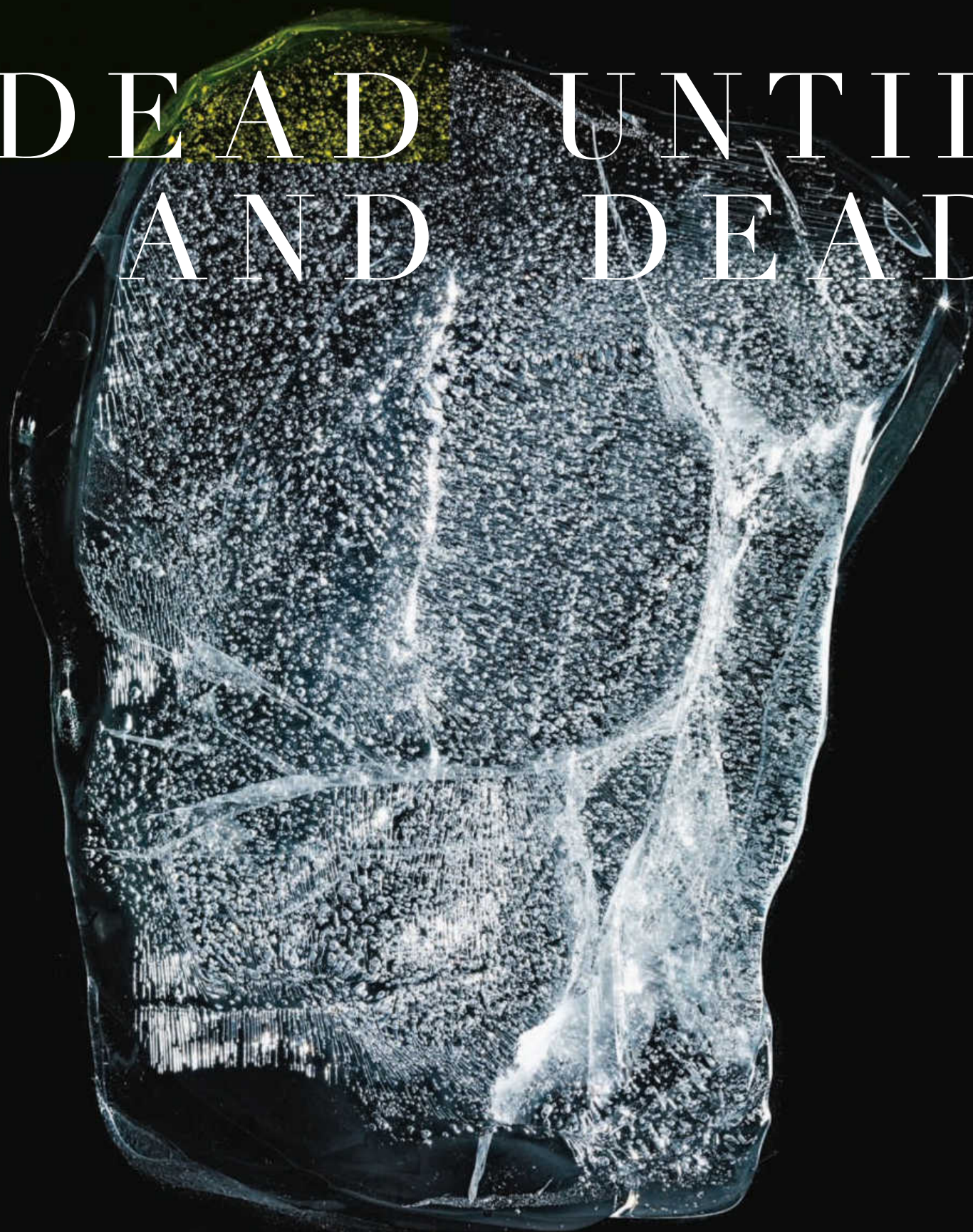
BY Rene Ebersole



MIRACLE ON ICE

The sun was setting over the Tantalus Mountains on March 31, 2014, when Christine Newman snowshoed past an empty ranger station and climbed the final rise to the Elfin Lakes shelter in Garibaldi Provincial Park, about 45 miles north of Vancouver. Twenty-four years old, with long blond hair, she was wearing rented snowshoes and a small day-pack and was hiking alone. Temperatures were headed for the twenties as she settled into a bunk with more than a dozen other campers there for the night. ¶ At breakfast the next morning, someone remarked that at around 2 A.M., Newman had told her that she was leaving because she wanted to get an early start back to the trailhead, about seven miles away. The night had been clear, and the trail was well marked, so no one worried. They finished their meals and headed out for the day.

DEAD UNTIL AND DEAD



YASU+JUNKO/TRUNK ARCHIVE

At 9 A.M., six friends from the shelter departed on skis and snowshoes for the 22-mile trek across the Garibaldi N  v   traverse. It was bright and sunny, and the wide-open plain was carpeted with a few inches of fresh snow. About a quarter-mile from the cabin, the lead skier noticed a backpack lying near a small hemlock tree. Immediately, he recognized it as Newman's. Others in the group saw tracks and heard a strange moan. Following the sound, they spotted the top of Newman's head sticking out of a tree well. She was gasping for air, and as Barb Linton, a snowshoer from nearby Squamish, remembers, "Her eyes were wide open, she wasn't blinking, and her hair was straggled down. We tried to pull on her, but she was stuck. We couldn't move her. She was frozen into the snow."

By the time they got her out, Newman had likely been buried up to her chest for seven hours. She was unconscious and in extreme hypothermia, and she had no detectable pulse. Linton, a former search-and-rescue volunteer, and her companions covered Newman with a sleeping bag and started CPR, while another friend on snowshoes rushed back to the hut and yelled for someone to call 911. It took two hours for rescuers to arrive and another two and a half hours to transport Newman to the hospital. Her body temperature was 62 degrees, and her chances of survival were slim. Clinically, she was almost dead.

Six years ago, Doug Brown, an emergency medical physician, mountain climber, and ultrarunner in Vancouver, would have said of Newman, "This patient is doomed. Let's stop resuscitation—we're torturing this body." But doctors are discovering that when it comes to hypothermia, the line between life and death isn't clear-cut. If you become severely hypothermic before your heart stops, the cold can actually become a protectant, making it possible for you to enter a state similar to suspended animation in which your metabolism slows to such a pace that your brain and organs can survive on a whisper of oxygen. (For every one-degree-Celsius drop in temperature, metabolism slows by 5 to 7 percent.) If a victim is discovered in time, he'll appear dead—dilated pupils, no detectable pulse, no breath—but if a rescuer knows to start CPR and get help, he might have a fighting chance. This is true especially if he's transported to a hospital with the technology to perform a procedure called extracorporeal membrane oxygenation, an advanced life-support system. ECMO involves a heart and lung machine that siphons the blood out of the body, filters, warms, and oxygenates it, and then zips it back in. Then doctors jump-start the heart with electrical current. The technology was invented decades ago, as



↑
*Frozen sperm
samples at a
cryobank*

life support for infant preemies, and is also used during open-heart surgery. Only recently has it gained wider use to save the lives of hypothermia patients.

Brown learned from European colleagues at a 2009 medical conference in Switzerland, where ECMO's use for hypothermia treatment was highlighted, that patients like Newman still had a good chance of surviving, and he began spreading the word among colleagues and search-and-rescue personnel in British Columbia. The team bringing Newman in called Brown, and he arranged to have her taken to Vancouver General, a hospital capable of administering ECMO.

Brown consulted with Vinay Dhingra, the on-duty critical-care specialist when she arrived. Dhingra had seen deep hypothermia before. "But not like this," he says. "We knew we had to be aggressive with her treatment—it would be futile if we weren't." They warmed her blood and then shocked her heart. "Right away we got a pulse," Dhingra says. A few hours later, with further treatment, she began to wake up. "She started to focus on us," Dhingra says, "following simple commands like shaking her head to answer questions." The next day, she was weaned off ECMO. On day three, she was removed from life support altogether. That evening, around

2 A.M., the night-shift nurses heard sounds coming from the ICU—Newman was singing. Two weeks later, she was released from the hospital.

HOW COLD IS TOO COLD?

Medical journals have published accounts of frozen people who were brought back from the edge of death and went on to live normal lives, with no brain damage, even after as many as seven hours of cardiac arrest. (Under normal circumstances, doctors call it quits at 20 minutes.) Hence a popular saying in medicine: "You're not dead until you're warm and dead."

"We've learned that there really is no temperature so low that you shouldn't try to save someone," says University of Manitoba thermophysicologist Gordon Giesbrecht, a.k.a. Professor Popsicle, who is one of the world's leading experts on hypothermia. "We used to say maybe 20 or 15 degrees C"—68 or 59 degrees Fahrenheit—"and below that don't bother. But then along came some cases that even at 13.7 degrees C"—about 57 degrees Fahrenheit—"given proper care, people survived. So now we've taken away the low-temperature threshold."

The survival stories make headlines: "Brought Back from the Dead!" Thirteen-month-old toddler Erika Nordby was declared

a miracle baby in February 2001 after she'd wandered out through an unlocked door on a two-degree night in Edmonton, Alberta, wearing nothing but a diaper and a T-shirt. Stunned to find Erika missing at 3 A.M., her mother looked outside and saw the baby on the ground. At the hospital, doctors managed to rewarm Erika; 24 hours later, she woke up and cried for her mother.

In May 1986, a group of high school students and teachers had climbed nearly to the top of Oregon's 11,249-foot Mount Hood when a spring snowstorm blew in and forced them to retreat. At 9,000 feet, facing temperatures of 15 degrees and winds as strong as 60 miles per hour, they built a snow cave, hoping to wait out the weather. In the morning, two of the students managed to make it back to camp, and a rescue mission was launched, but it was delayed another day by the storm. Eventually, after repeated attempts, the remaining students and teachers were brought down off the mountain and taken to various Portland-area hospitals to receive ECMO. Most were too far gone to respond to treatment, but two 15-year-olds survived. (ECMO was used as early as 1977 in the U.S. for hypothermia, but the procedure still isn't widespread or often taught in medical school.)

More recently, in April 2014, a 15-year-old boy named Yahya Abdi stowed away in the wheel well of a Boeing 767 that flew from San Jose, California, to Maui. Aviation and medical experts were in disbelief: how could he survive the air pressure at 38,000 feet and temperatures as low as minus 80 degrees? According to reports, Abdi remembered blacking out shortly after takeoff, but his heart apparently kept beating very slowly. When the plane landed in Hawaii, five and a half hours later, he emerged from his hiding spot unharmed.

Understanding how some people cheat death and pinpointing the precise moment when hypothermia sets in are mysterious affairs. In general, the dominoes start to fall when a person loses body heat faster than it's produced. The first signs of mild hypothermia begin at the 95-degree mark with the onset of uncontrollable shivering—the body's attempt to warm itself. Gradually, as you creep toward moderate hypothermia (90 degrees), skin grows pale, lips turn blue, and speech begins to slur. Sink deeper than 82—severe hypothermia—and you lose consciousness. Left in the cold, your body will continue to drop in temperature, and your heart will beat slower and slower until you experience cardiac arrest and die.

However, if you're discovered during the stage in which your heartbeat is slowing, like Christine Newman was, your odds of sur-

vival improve. Sometimes the jostling caused by pulling a victim out of the ice can trigger cardiac arrest, referred to as rescue collapse. But because a person is in a cold state, and the brain requires less oxygen, CPR can keep a victim alive for hours, compared with minutes in warmer conditions.

If you're transported to a hospital with an ECMO-trained staff, you have a 50 percent chance of surviving without neurological damage, according to Beat Walpoth, a cardiac surgeon at Geneva University Hospitals in Switzerland, who published some of the earliest studies on the effectiveness of treating severe hypothermia. Walpoth is currently leading the International Hypothermia Database, which is gathering patient case histories from around the world to create guidelines for treating hypothermia victims.

Meanwhile, what doctors are learning from survivors like Newman is providing clues to medical technology that could rescue others assumed dead in the cold—and also potentially save heart-attack, car-accident, and gunshot-wound victims. And research at the frontiers of extreme cold doesn't stop there. Elite athletes, for starters, are jumping into cryotherapeutic chambers, human-size vessels filled with liquid-nitrogen-chilled air, hoping to accelerate recovery and improve performance. We are on the cusp of a new era in far-out science, and it's rooted in ice.

THE CASE OF THE AMPHIBIAN POPSICLE

In the past half-century, we've become very good at freezing tiny things: blood, stem cells, tumors, semen, eggs, ovarian tissues, seeds, embryos. But researchers looking for ways to put the chill on complex tissues and organs face the same challenge that plagues the steak in your freezer: ice crystals, or freezer burn. When that forms, it damages tissues.

So far no one has figured out how to overcome this problem. But some scientists think a tiny amphibian, the wood frog, might hold at least part of the answer. With an expansive range stretching from Georgia to north of the Arctic Circle, the wood frog spends weeks, even months, in a state of suspended animation. It can freeze solid in winter, devoid of all vital signs, then quickly thaw in the spring, hopping off to mate.

Some of the latest research in hibernating amphibians comes from Fairbanks, Alaska, where a 29-year-old scientist named Don

Larson recently kept tabs on wild wood frogs as they overwintered. Scientists have long known about the species' cold-weather coping strategies, but Larson's study revealed that the frogs can remain frozen for as long as seven months, and at colder temperatures than previously known—down to almost zero degrees. "They're spending more time frozen than most foods can be left in your freezer," Larson says.

His study adds to 25 years of research at the University of Miami's Laboratory for

"WE'VE LEARNED THAT THERE REALLY IS NO TEMPERATURE SO LOW THAT YOU SHOULDN'T TRY TO SAVE SOMEONE," SAYS THERMOPHYSIOLOGIST GORDON GIESBRECHT, AN EXPERT ON HYPOTHERMIA.

Ecophysiological Cryobiology in Oxford, Ohio. "These animals have been able to pull off something really remarkable," says senior research scholar and zoology professor Jon Costanzo.

Costanzo's studies have shown that just before freezing, the frogs flood themselves with huge quantities of glucose, which behaves like a kind of cryoprotectant. As the mercury drops the frog's body freezes, with just enough water left in the interior of its cells to prevent its membranes from being damaged until the days begin to grow longer and the ground becomes warmer. Then, over the course of a day or so, the animal regains a pulse and springs back to life.

Frogs aren't very similar to humans, but this knowledge has applications in the important field of organ transplants. Taking a cue from the frogcicles' ability to flash-freeze and spontaneously defrost, doctors hope to one day use cryopreservation to extend the use-by date of donor organs (currently four to six hours for a heart or lungs, 12 to 18 hours for a liver). Every ten minutes, a patient in the U.S. is added to the organ-transplant waiting list. Each day, an average of 79 people receive transplants, but 22 perish waiting for a phone call. The solution would be to preserve organs indefinitely, so they can be held until a suitable match is found.

One of the biggest breakthroughs in the attempt to freeze organs came in 2009, when cryobiologist Greg Fahy and his California-based company 21st Century Medicine,

THE OUTDOOR
INDUSTRY IS
THE NEXT NRA

Not so long ago, the outdoor industry had essentially zero influence in state and national politics.

Though individual companies played a role in conservation campaigns and other causes, there was little collective muscle to push issues like boating access to rivers and lakes the way, say, Big Oil can fight against higher fuel-efficiency standards in cars. That's started to change in recent years, thanks to two developments. First, in 2006, the Outdoor Industry Association (OIA) began publishing an annual report detailing the massive impact of recreation on the U.S. economy, now responsible for \$646 billion in annual consumer spending (twice what Americans spend on pharmaceuticals) and 6.1 million jobs (a big enough number that recently proposed legislation could require the Commerce Department to start tracking it). Second, in 2013, Sally Jewell, then CEO of REI, became secretary of the interior, instantly guaranteeing that recreation would be a part of every major discussion about the use of federal public lands. While the outdoor industry still invests few dollars in lobbying—the OIA's political-action committee spent just \$36,926 during the 2014 election cycle—"a lot of policymakers on both sides of the aisle are really drawn to this industry," says Alexander Boian, senior director of government affairs for the OIA. "They understand that recreation is a sustainable economic driver."

Luis Benitez, director of Colorado's Outdoor Recreation Industry Office—one of three similar state-government offices created in recent years—puts it more directly: "I now have senators from all over the state showing up in my office saying, 'Tell me what legislation you want.'" —REID SINGER



unveiled a technique that came close to conquering the ice-crystal conundrum. He used a chemical cryoprotectant to successfully cool a rabbit kidney to a vitrified, or glass-like, state, then thawed and transplanted the organ into a live rabbit. His landmark success offered hope that vitrification would revolutionize organ banking. Trouble is, ten years later, no one has figured out how to apply the technique to human organs, because using higher concentrations of chemical cryoprotectants can poison the cells and tissues they're supposed to protect.

Other scientists are working with the cold technology already at hand. In the 1950s and '60s, research by scientist Peter Safar, known as the father of modern resuscitation, led to the experimental use of therapeutic hypothermia for treating comatose patients in the ER. He and his colleagues showed that the therapy, which involves a number of techniques to chill the body (including cooling blankets, ice, and catheters filled with a cold saline solution), successfully reduced tissue injury and brain damage from lack of blood flow, particularly in people who'd suffered a heart attack or stroke. The technique is still used today to treat those conditions, along with spinal injuries and newborn babies showing signs of impaired brain function.

At the UPMC Presbyterian hospital in Pittsburgh, surgeons are experimenting with putting critical patients who have suffered severe gunshot and knife wounds into a state of suspended animation by flushing their arteries with ice-cold saline to supercool the brain and organs.

"Time is of the essence," says Sam Tisher-

↑
CLOCKWISE
FROM TOP LEFT:
Christine Newman
receiving CPR;
survivor Anna
Bagenholm;
a frozen wood
frog; physician
Doug Brown

man, an expert in trauma surgery who is spearheading the human trials and is preparing to launch a second study in Baltimore. "We are racing against the clock to control bleeding before irreversible damage occurs to the brain and

other organs." The procedure, called emergency preservation and resuscitation, buys surgeons more time to control a patient's bleeding. After the repair work is done, the doctors gradually rewarm the patient by restoring natural blood flow.

"The goal is to save people who would otherwise have died," says Tisherman, who has played close attention to stories of frozen survivors. "Knowing that people who cool very fast can tolerate not having oxygen or blood flow for an hour or more inspired our work."

CHILLING OUT

Though athletes have been icing post-workout for decades, debate continues as to whether it actually boosts recovery. But that hasn't stopped the recent boom in ice technology. Cryotherapy salons are popping up in cities around the country, offering a quick alternative that's like an ice bath on steroids.

Spa-goers strip down to their underwear and put on athletic socks, terry cloth robes, and wool mittens for a trip inside a tin-can-shaped cryotherapy chamber filled with air that has been nitrogen-cooled to between minus 184 **continued on page 96** →

VEGANS WILL OWN THE PODIUM

Why more and more pro athletes power up with plants

BY Matt Skenazy



“**Kale** is high in nitrates, which increase blood flow and speed recovery, and is packed with vitamin K, which strengthens bones.”

← “**Beyond Meat chicken strips** are among the cleanest vegan-protein products I’ve seen. A lot of other meat alternatives are loaded with junk.”

“**Avocados** are high in good monounsaturated fats and omega-3’s and have as much potassium as a banana.”

“Most people are vitamin-D deficient. **Mushrooms** are a great way to load up.”

↑ “The **rice-vinegar dressing** is full of antioxidants to keep you healthy during heavy training.”

“Plant proteins are anti-inflammatory, and **quinoa** is the only grain that’s a complete protein.”

“**Garbanzo beans** together with the quinoa provide a ton of protein, which is crucial for muscle repair. Combined with the Beyond Meat strips, there are around 40 grams of protein here.”

Get the full recipe at outsideonline.com/vegan.

The Missing Link

Vitamin B12, which helps keep blood cells healthy, occurs mainly in animal protein. Vegans should consider a fortified plant milk like Silk Unsweetened coconut milk (\$4; silk.com), which contains 50 percent of the recommended daily amount per serving.

IN 1991, A YEAR after going vegan, track star Carl Lewis put on the performance of his life at the World Championships in Tokyo, winning two golds and a silver. Lewis’s victory did little to encourage other competitors to renounce high-protein meats, but fast-forward to today and a growing number of pro athletes are switching to nonanimal fuel—from climbers (Steph Davis) and ultrarunners (Scott Jurek) to NFL linemen (David Carter) and tennis players (Venus Williams). All of them claim that a plant-based diet makes them feel and perform better. Just as important, the recipes they’re using are delicious and—surprise—loaded with protein. Take this veggie and quinoa bowl, a go-to recovery meal of 18-year-old pro surfer Tia Blanco. We asked Danielle LaFata, director of nutrition at Exos, an elite training facility in Phoenix, to break it down.



ADHD IS FUEL FOR ADVENTURE



Some of the best medicine for kids with attention-deficit disorders may be extreme sports and outdoor learning. That's good news, because not only do they need exploration, but exploration desperately needs them.

By Florence Williams

By second grade, it was clear that while Zack Smith could sit in a chair, he had no intention of staying in it. He was disruptive in class, spoke in a loud voice, and had a hard time taking turns with others. His parents fed him a series of medications for attention-deficit hyperactivity disorder, or ADHD, many of which didn't work. Zack, who attended school in West Hartford, Connecticut, was placed in special classrooms where he showed a propensity for

lashing out. Twice suspended, he was miserable. He didn't seem to care about anything at school. When his parents realized that his path would likely lead to worse trouble, they pulled the ripcord on eighth grade.

Where Zack eventually landed is clinging spread-eagle to an east-facing slab of quartzite in the West Virginia panhandle. His chin-length, strawberry blond hair curls out beneath a Minion-yellow helmet. A harness cinches his T-shirt—the sleeves of which have been ripped off—obscuring the CALL OF DUTY: ADVANCED WARFARE lettering.

"I have a wedgie!" he bellows out from 20 feet up.

Belaying him is another 14-year-old—pale, earnest Daniel. Earlier in the day, Daniel asked, "Do I have to belay? I'm only 95 pounds." Both kids still look a little apprehensive, but there's no question that they are paying full attention to the wall of rock and

to the rope that unites them. Yesterday beneath a picnic awning in a campground near Seneca Rocks, they and 12 other scrappy teens from the Academy at SOAR learned how to tie figure-eights and Prusiks, the knots that would safeguard their lives, under the tutelage of trip leader Joseph Geier, the academy's director, and seven other energetic field instructors mostly in their twenties. The students' ages span five years, but in the spectrum of puberty, the younger kids look like they could be the square roots of the biggest ones. Zack occupies an awkward middle ground, lanky and knock-kneed, with a surprisingly deep voice and a crooked smile.

He gradually moves his right foot to a new nub and pulls himself higher. He scrabbles upward, finally victoriously slapping a carabiner on the top rope before rappelling down. "Oh man, my arms hurt," he says at the bottom, his pale cheeks flushed from sun and exertion. Daniel accidentally steps on the climbing rope and, per the rules, has to kiss it. This happens so often that no one remarks on it. For a moment both boys cheer on Tim, a small boy from the D.C. area with bright eyes behind eyeglasses so thick they look like safety gear. The aspirational name tape on the back of his helmet reads T BONE SIZZLER. A group chant begins: "Go, Tim, go—oh, go Tim!"

Before enrolling in this adventure-based boarding school for grades seven through twelve, Zack, like a lot of these students, had already spent some summers at SOAR's Balsam, North Carolina, camp or its programs in California, Florida, and Wyoming for kids of both sexes with ADHD, dyslexia, and other learning disabilities. SOAR's founding principle—radical several decades ago and still surprisingly underappreciated—was that kids with attention deficits thrive in the outdoors. Since then ADHD diagnoses have exploded—11 percent of American kids are now said to have it—while recess, PE, and access to nature have shriveled miserably.

Zack's first SOAR summer involved a three-week stint of horse-packing in the Wind River Range. Before the trip, he says, he would have preferred to stay home and play video games. "I hated nature," as he puts it. But something clicked under the wide Wyoming skies. He found he was able to focus on tasks; he was making friends and feeling less terrible about himself. Zack turned his restlessness into a craving for adventure—which is perhaps what it was meant to be all along.

IT'S ONE THING to let kids unplug and run loose in the woods in summer, but shifting the whole academic year outside—SOAR students alternate two weeks on the forested campus in North Carolina and two weeks

in the field—reflects either parental desperation, intrepid educational insight, or a combination of the two. Zack's backstory is a common one, especially among boys, who are diagnosed at more than twice the rate of girls. History is full of examples of restless youths who went on to become celebrated iconoclasts, like wilderness advocate John Muir, who spent his early childhood sneaking out at night, dangling from the windowsill by his fingertips, and scaling treacherous seaside cliffs in Dunbar, Scotland. Frederick Law Olmsted, who would later change the torso of Manhattan and influence scores of other cities with his park designs, hated school. His tolerant headmaster would let him roam the

THIS TETHERED BAND OF MISFITS MIGHT LOOK LIKE MERRY MISCREANTS, BUT THEY HOLD CLUES TO THE ADVENTURE IMPULSES LURKING IN ALL OF US, IMPULSES THAT ARE INCREASINGLY AT RISK IN A WORLD MOVING INDOORS.

countryside instead. Ansel Adams's parents plucked their fidgety boy out of class, gave him a Brownie box camera, and took him on a grand tour of Yosemite. It was unschooling, California style.

Olmsted, looking back on his life, identified the problem as the stifling classroom, not troublesome boys. "A boy," he wrote, "who would not in any weather & under all ordinary circumstances, rather take a walk of ten to twelve miles some time in the course of every day than stay quietly about a house all day, must be suffering from disease or a defective education."

The Academy at SOAR—which became accredited three years ago—is determined to find a better way. The school has just 32 students, 26 of them boys, divided into four mixed-age houses. Each kid has an individualized curriculum, and the student-teacher ratio is five to one. Tuition is a steep \$49,500 per year, on par with other boarding schools, although you won't find a Hogwartsian dining hall or stacks of leather-bound books. The school still covers the required academics, as well as basic life skills like cooking, but finds that the kids pay more attention to a history lesson while standing in the middle of a battlefield or a geology lecture while camping on a monocline.

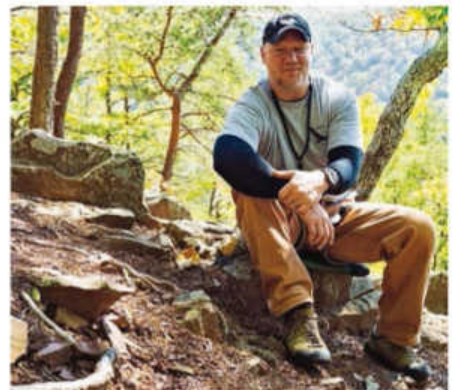
"We started from scratch," says SOAR's executive director John Willson, who began working there as a camp counselor in 1991. "We're not reinventing the wheel—we threw out the wheel." The school's founders didn't have any particular allegiance to adventure sports; they just found that climbing, backpacking, and canoeing were a magic fit for these kids, at these ages, when their neurons are exploding in a million directions. "When you're on a rock ledge," Willson says, "there's a sweet spot of arousal and stress that opens you up for adaptive learning. You find new ways of solving problems."

Some of the teens who arrive at SOAR are still putting their clothes on backward, not uncommon among kids with ADHD. They forget to eat or they can't stop. They lash out in anger, and they're easily frustrated. Symptoms tend to express themselves differently in boys and girls. The classic symptoms in boys, which are better understood, are hyperactivity, impulsivity, and distractibility; girls tend to show less of the hyperactivity, which makes the condition harder to spot. We all fall somewhere on the continuum of these traits, but people with more-extreme symptoms

appear to have different chemistry in the parts of their brains that govern reward, movement, and attention. They may have trouble listening or sitting still, and they get distracted by external stimuli. They can be hyper-focused, but they also get bored easily, so they tend to be risk takers, looking for charged activities that help flood their brains with feel-good neurotransmitters like dopamine and norepinephrine, which otherwise get gummed up in the ADHD brain. Kids with the condition are more likely to suffer head injuries, accidentally ingest poisons, and take street drugs.

With all these liabilities, you might think such heritable traits would diminish in humans over time; that's the way Darwin awards work. The fact that they remain so common, though, means that these same characteristics must have once conferred tremendous advantages on individuals and ultimately on the human race.

It's worth taking a look into the brains of kids like Zack, because not only do kids with ADHD need exploration, but exploration needs them. Zack and his tethered band of misfits might look like merry miscreants, but they hold clues to the adventure impulses lurking in all of us, impulses that are increasingly at risk in a world moving indoors—onto



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CLOCKWISE FROM TOP LEFT: Students ascending a pitch at Seneca Rocks, West Virginia; the North and South Peaks of Seneca Rocks; taking a break from learning rope skills; climbing the pitch; SOAR trip leader Joseph Geier; a knot-tying relay race; belaying a classmate; downtime in camp; practicing knots.

screens and away from nature. Attentional mutants everywhere have saved the human species, and they may yet spare us the death of adventure.

THE HUMAN BRAIN evolved outside, in a world filled with interesting things, but not an overwhelming number of interesting things. Everything in a child's world was nameable: foods, creatures, the stars. We were supposed to notice passing distractions; if we didn't, we could get eaten. But we also needed a cer-



YOUR LOCAL SKI AREA SHOULD BE A NONPROFIT

It's no secret that small hills are having a tough go of it. Between tight budgets, changing weather, and ever expanding conglomerate resorts, the only way to survive may be to forgo the pursuit of cash and seek 501(c) status. "It helps on taxes, and it may create some additional opportunities to reinvest in the ski area as a local community asset," says Dave

Byrd, director of risk management at the National Ski Areas Association. Take Antelope Butte in northern Wyoming. In 2011, when officials at Bighorn National Forest considered tearing down the facilities, locals created the nonprofit Antelope Butte Foundation to accept private funds; last September, the foundation made a \$55,000 down payment on the \$275,000 purchase price for the ski area. "It's ours to either make happen or not," says Andrew Gast, the foundation's executive director, who hopes to reopen the resort next winter. The move has already worked at smaller mountains like Acutney in Vermont, Bogus Basin in Idaho, Mount Ashland in Oregon, and Bridger Bowl in Montana. At the former Hidden Valley ski area in New Jersey, the National Winter Activity Center, a nonprofit for teaching kids to ski and ride, will open for its first full season this winter. It's about more than nostalgia or keeping an affordable mountain nearby; it makes good economic sense, too.

"Even for people who don't ski," Gast says, "people are excited about keeping jobs right here." —REID SINGER

tain amount of stick-to-itiveness so that we could build tools, stalk game, raise babies, and plan big. Evolution favored early humans who could both stay on task and switch tasks when needed, and our prefrontal cortex evolved to let us master the ability. In fact, how nimbly we allocate our attention may be one of humanity's greatest and most distinctive skills, argues neuroscientist Daniel Levitin of McGill University.

Most humans had brains that craved novelty and wanted to explore—to a degree. This worked out for us. As Levitin writes in *The Organized Mind*, our species expanded into more habitats than any creature the earth had ever seen, to the point where humans plus our livestock and pets now account for 98 percent of the planet's terrestrial vertebrates. But evolution also favored variability, and some of us pushed exploration more than others.

Wondering if we have a specific adventure gene, researchers have looked at the DNA of humans in the farthest reaches of the globe—the descendants of people who kept moving until there was no place else to go. One mutation kept popping up: a variant called 7R on the DRD4 gene that helps

IF YOU TAKE A TYPICAL
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regulate how signals from dopamine are processed. People with 7R are more likely to take financial risks and to travel and try new things, probably as a way to juice up their stingy dopamine delivery. Long story short, this gene mutation, which affects roughly 20 percent of today's global population, does indeed cluster in places like Siberia, Tierra del Fuego, and Australia, where humans had migrated over the longest routes.

It turns out that the gene also clusters in people who have ADHD. It would be too easy to say that any one gene or set of genes explains the human capacity to explore or explains ADHD, since both are determined by numerous genetic and environmental factors. And not all kids with ADHD like risk taking. But to Dale Archer, a Lake Charles, Louisiana, psychiatrist and author of *The*

ADHD Advantage, the link makes sense. Once upon a time, the dominant traits of ADHD were highly adaptive. They were—and still can be—gifts that enable rapid interpretation of sensory data, thinking on your feet, curiosity, and creative restlessness. "The thing with the ADHDer is that we get bored easily but we do great in a crisis, we can function really well," says Archer, a surf kayaker, solo sailor, and cyclist who shares the diagnosis with his adult son. According to him and others in the learning-differences community, Napoleon probably had ADHD (along with some other issues) and so did Captain James Cook, Ernest Shackleton, Thomas Edison, and Eleanor Roosevelt.

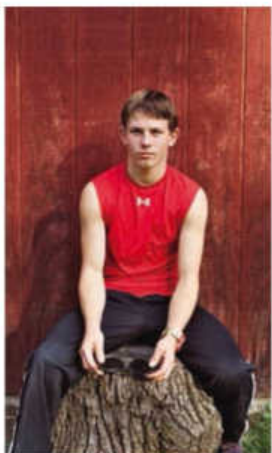
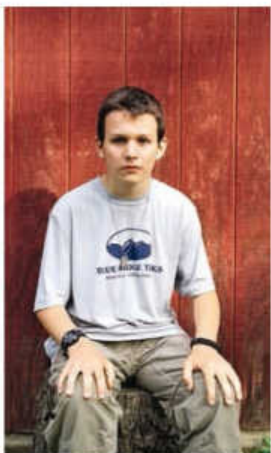
If you take a typical ADHD kid, layer on some experience and maturity, tamp down the impulsive bits, and add some goal aspirations and a keen ability to plan and dream, you end up with a high-adrenaline achiever like alpinist Conrad Anker or adventurer Sir Richard Branson, both of whom believe they have the condition. They are comfortable in extreme environments, enlivened by risk, able to thrive on the unknown. When Branson dropped out of school at age 16 to

start his first company, he says, "The headmaster told me that I would either end up in prison or become a millionaire." Since then he has scored two first-ever transoceanic ballooning records, received eight helicopter rescues, and founded the Virgin Group.

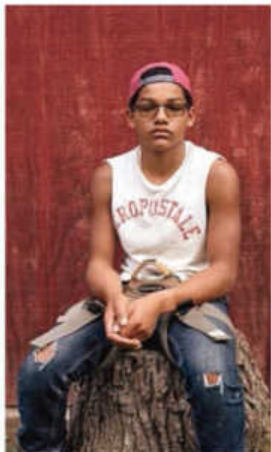
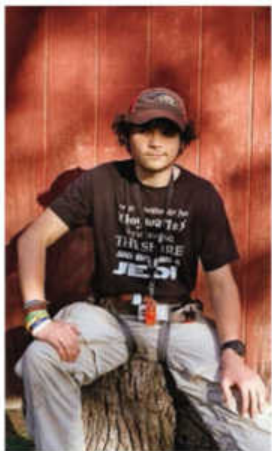
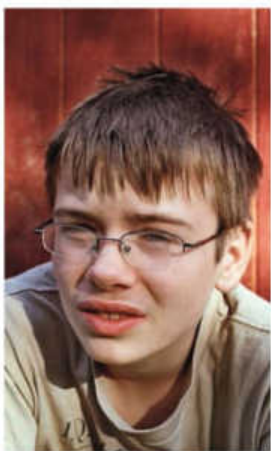
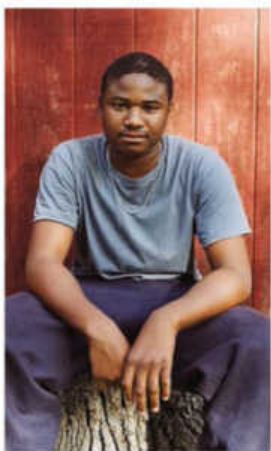
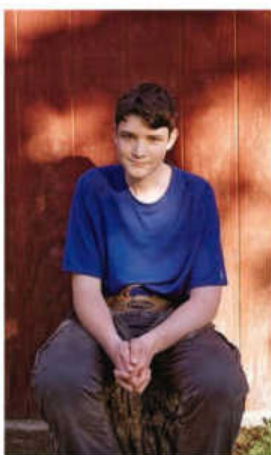
"I am hyper situationally aware," says Anker. "It was a trainwreck in second grade—every input received my attention. When I'm alpine climbing, that keeps me alive."

Anker can nimbly process snow conditions, incoming weather, and rope integrity to make quick decisions. His brain likes intense environments, he says, but too much pointless stimulation, like on a busy city street, drives him bananas. Precision wingsuit flier Jeb Corliss was diagnosed with ADHD when he was ten. "My sisters are normal people. I'm hyper, yeah, big deal," he says. "I believe that a lot of people are like that, and they use it to their advantage." Corliss says flying through the air is when he feels calm and peaceful.

As a laconic, impulsive, and depressed teen in northeast Ohio, Matt Rutherford landed in juvenile detention five times for petty crimes and in rehab twice. Some 15 years later, he became the first sailor to circumnavigate the Americas alone. During his 308 days at sea, his secondhand 27-foot boat started falling apart under **continued on page 97 →**



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SOAR students with
instructors Michael
Morgen (top row,
second from right),
Dawn Shannon
(second row, second
from left), Jessica
LeFiles (third row,
far left), Jeffrey Grabe
(bottom row, second
from left) and Jacquie
Herrera (bottom row,
far right)



YOU CAN ACTUALLY HEAR THE CLIMATE CHANGING

Bernie Krause's vast library of field recordings reveals a sad truth: wild sounds are quickly vanishing

BY Leath Tonino



SOUNDSCAPE ecologist Bernie Krause has recorded jaguars in the Amazon, ice in Antarctica, insects in Zimbabwe, rainstorms in Borneo, and orcas in the Pacific. The 77-year-old began studying nature's sounds at age 30, later earning a Ph.D. in creative arts. (This was after two successful decades as a musician and producer.) He has since traveled to the world's most remote areas to create an audio library that began as an inventory of the intricate symphonies unique to each ecosystem but has become a way to document biodiversity and, most recently, loss.

Krause's archive now consists of 5,000-plus hours of what he calls "whole habitat" field recordings. To get them, he sets up a wind-protected microphone on a tripod, plugs it into a handheld recorder, and captures everything that occurs. More than half of the 3,700 habitats represented in the archive—from Yellowstone to Australia to his own backyard in Glen Ellen, California—are now either totally silent or severely diminished because of human activities like mining, logging, poaching, real estate development, airplane traffic, warfare, and climate change. *Outside* spoke to Krause shortly after the release of his new book, *Voices of the Wild: Animal Songs, Human Din, and the Call to Save Natural Soundscapes*, to discuss how wild sounds allow us to examine changes that may otherwise go unnoticed—and whether they might be on the verge of vanishing forever.

OUTSIDE: What is soundscape ecology?

KRAUSE: Most of our writing and thinking about the natural world is visual. If it looks

pretty, if it's visually spectacular, that's what we concentrate on. We have the descriptive language for that kind of reflection. But we have few words to describe in any great detail the sounds we hear when walking in the woods. Soundscape ecology is, in part, a response to this gap. It's the study of the sound that comes from the landscape—urban, rural, or wild. I concentrate on the organisms in remote and still-untrammeled places. I call this the biophony: all the living organisms that vocalize in a given habitat, sounding together. There's also natural sound in a habitat from wind in the trees and water in a stream. I refer to these non-biological sounds as the geophony.

In your new book, you point out that these biophonies provide us with "numerous prisms through which to view our relationship to the non-human critter world."

It's so important that we begin to investigate these prisms and explore what they have to teach us—and soon. The natural soundscape is very fragile, and it's disappearing very quickly.

Which sounds are the first to go?

Usually, it's what's called partitioning. In a healthy habitat, insects, amphibians, reptiles, birds, and mammals form acoustic niches, sonic territories that they establish so that their voices can be heard unimpeded by others. These partitions are critical to their survival. Their cohesion begins to break down in habitats that are stressed even in slight ways.

For example, there are logging companies that believe selective logging projects will have almost no environmental impact; you're just taking out a tree here and there. But if you pay attention to the sounds of the living organisms inhabiting a given site, another story will often emerge. If you can get a baseline recording before the selective logging takes place, and then a follow-up recording after the first cuts have been made, you'll likely hear some notable changes.

What impact has the drought had on the biophony around your home in California?

There was absolutely no birdsong this past spring or summer in Valley of the Moon, in Sonoma County. There were birds, and there were a few calls, but no song.

You've spent a significant amount of time recording in this area, especially at Sugarloaf Ridge State Park.

I first recorded at Sugarloaf in 1994. It's a 20-minute drive from my home, so it's convenient and can be accessed spontaneously. Also, I wanted to measure the dynamic equilibrium of the site—the range of its biophonic expression with regard to density and diversity—over the course of the spring season. When I didn't feel like taking extended trips abroad, I could still record at this spot, which I grew to love.

What changes have you observed there over the past 20 years?

Most of my recordings at Sugarloaf have been done in March and April, at dawn,



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Krause in
California's
Sugarloaf Ridge
State Park

when it's quite cool—typically in the low thirties. I usually set up just before nautical twilight, when it's still dark on the ground but the horizon is pretty well outlined by the



Listen to Krause's recordings of a dying reef in Fiji, a clearcut forest in Costa Rica, and a drought-stricken Northern California meadow at outsideonline.com/soundscapes.

coming light. There's no wind at that hour. The only sound is the stream, which flows through the landscape some 50 yards from where I typically record. Normal rainfall in the area is around 30 inches per year; the past four years we've been averaging fewer than eight. When the stream has no water because of that lack of precipitation, the stillness is eerie and a bit disconcerting.

In 2004, when the stream was running fully charged, the biophony was comprised of birdsong from dark-eyed juncos, golden-crowned and white-crowned sparrows, California towhees, acorn woodpeckers, black-headed grosbeaks, American robins, Brewer's sparrows, red-shouldered hawks,

pileated woodpeckers, and wild turkeys. Between 2009 and 2015, under the full impact of the drought, you hear an almost complete lack of density and diversity. Whether or not it regains vitality remains to be seen. It's a true narrative, telling us that something is desperately wrong.

Do you think the soundscape can recover?

It's always in a state of flux. That's why you will never hear the same kind of recording more than once. I'm coming to believe that no matter what we humans do, something will manage to adjust and survive. It probably won't be us, though.

— AVALANCH NEEDS A REV



Manuel Genswein has spent more than two decades burying himself alive and pushing shovels to their breaking point to determine the best ways to save snow-slide victims. His biggest challenge? Convincing the world's most experienced rescuers that he's right.

BY Devon O'Neil


THE THEORY *of* EVERYTHING

#7 *Outside Magazine*

ERESCU OLUTIONARY



PHOTOGRAPH BY **Hannah McCaughey**



On January 7, 2008, Todd Weselake, a 23-year-old photographer living in Fernie, British Columbia, picked up two friends, Janina Kuzma and Ian Bezubiak, for a morning of backcountry skiing and snowboarding on the northern slopes of Mount Proctor, a 7,851-foot peak within view of town. The trio snowmobiled up a valley for 45 minutes, then climbed to an alpine ridge where they began their descent.

From the start, they knew to be careful: prolific early-season storms had left the snowpack layered and unpredictable. Though Weselake had snowboarded the same run the previous day without incident, he and his partners descended with caution. They stuck together on low-angle slopes, where they crossed tracks from the day before, then paused above a wide gully halfway down. When Bezubiak, who was 23 at the time, skied across the entry to test the snow stability, his weight triggered a two-foot-deep, twenty-foot-wide slab avalanche that raged downhill like water released from a dam. Suddenly on high alert, they moved into the trees, where slides are less common, and began making their way down the rest of the slope one at a time to limit their exposure.

Almost immediately, they felt a substantial collapse of snow beneath them. Kuzma, a 22-year-old professional freeskiier from New Zealand, grabbed a fistful of branches. Bezubiak bear-hugged a tree. But Weselake disappeared as a torrent of snow swept him on his back headfirst down the slope.

Kuzma, who was left standing atop the two-foot-tall avalanche crown, leaped down to the bed surface, the layer left behind after a slide. She and Bezubiak switched their avalanche beacons to receive mode and began a frantic search of the debris field for Weselake. Kuzma's device led her 1,150 feet down to the bottom of the slide path, where the reading indicated that they were within a few feet of him. Bezubiak performed a more precise search to pinpoint Weselake's location, then Kuzma drove her probe into the snow and hit him almost immediately. They whipped out their shovels for the hardest and most time-consuming phase of any rescue: digging. They knew Weselake was buried six feet deep and that his chances of survival were falling fast.

Instead of using the traditional method to excavate an avalanche victim—digging vertically into the snow along the path of the probe—Bezubiak and Kuzma employed a new technique they'd learned at a three-day course in Fernie less than a month ear-

lier. It was called the V-shaped conveyor method and was reputed to cut excavation time nearly in half. They started downhill of the probe by 1.5 times the burial depth and dug into the snow horizontally instead of vertically, thereby limiting the risk that they'd collapse Weselake's air pocket. Kuzma started at the front, chopping the hard debris into movable chunks, which Bezubiak then paddled away, as if he was kayaking, which widened the tunnel. When Kuzma got tired, they switched places.

Nearly 23 minutes after the avalanche occurred, they reached Weselake, who was unconscious and laboring through sporadic, shallow breaths. Bezubiak unclipped Weselake's camera to relieve the pressure on his chest, and a few minutes later he began mumbling. Fifteen minutes after that, he could move. The group eventually evacuated under their own power.

THE VOICE ON THE OTHER
END TOLD HIM THAT HIS
SHOVEL TEST—CONDUCTED
UNDER THE UMBRELLA
OF THE AUSTRIAN ALPINE
CLUB—HAD MADE HIM A
MARKED MAN. "YOU WON'T
LIVE TO SEE THE SPRING,"
THE CALLER SAID.

In the days that followed, word spread through the Fernie area about the miraculous rescue. Weselake's survival chances, based on how long he had been buried, were roughly 25 percent. If he had remained under the snow for ten minutes longer, those odds would have plummeted to 8 percent. "We realized that their shoveling had made the difference," says Duncan Maisels, a British Army officer turned ski guide who taught

Bezubiak and Kuzma the V-shaped conveyor method. "It was like, 'Oh, my God. The technique really worked.'"

Three months later, Weselake sent an e-mail to a Swiss avalanche researcher named Manuel Genswein, who conceived and developed the conveyor method the previous winter and has included it as part of an international standard he's now proposing to the global rescue community. Genswein taught the procedure to Maisels and Weselake at a preseason safety clinic. Maisels later taught it to Kuzma and Bezubiak.

"My friends used the new technique," Weselake wrote to Genswein. "I am sure that this saved my life."

THE V-SHAPED conveyor method is just one of Genswein's many contributions to avalanche safety. He has helped design four beacons, including Mammut's bestselling

Pulse Barryvox, and a revolutionary long-antenna transceiver that tripled the search range for aerial rescuers. No expert in the field exerts more influence on a global scale than Genswein, who works as a one-man institute based in Lenzerheide, Switzerland, and travels six months out of the year teaching avalanche courses in 26 countries and five languages. He almost exclusively trains other instructors, be they senior guides at heli-ski operations in North America, professional rescuers in the Alps, or mountain

soldiers in the Norwegian, Dutch, Swedish, Austrian, and Indian armies.

"There's nobody else in the world who's done what Manuel has done," says Bruce Tremper, the longtime director of the Utah Avalanche Center and one of the field's most respected voices.

When he's not teaching, Genswein, 41, researches ways to optimize every facet of the rescue process, challenging decades-old



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Genswein
on a tram in
Lenzerheide,
Switzerland,
last September

techniques in an unapologetic manner that has made him arguably the most polarizing figure in alpine rescue. If you are one of the approximately 900 attendees at the International Snow Science Workshop, a biannual conference that brings together the avalanche world's brightest minds and ideas, or the roughly 400 elite rescuers who attend the annual congress of the International Commission for Alpine Rescue (ICAR), where pros share new research and debate best practices, chances are you've seen Genswein engage in heated discussions with other experts over technique or technology.

In 2007 and 2008, he carried out an infamous field test that revealed many of the most expensive rescue shovels to be flimsy tools, dumped on consumers to keep profits churning. After the results were published in the Austrian magazine *Bergundsteigen*, Genswein says he received a phone call from an unidentified number. The voice on the other end told him in German that his shovel test—conducted under the umbrella of the Austrian Alpine Club—had made him a marked man. “You won’t live to see the spring,” the caller said.

No one ever tried to kill Genswein, as far

as he knows, but the threat underscored the ruthless competition and business principles in the avalanche-safety industry, particularly at that time. Genswein, an independent consultant in a field dominated by government institutions and powerful manufacturers—some of which he has worked for on a freelance basis—still claims neutrality, for better or worse.

“I respect the fact that he’s an equal-opportunity destroyer,” says Jake Hutchinson, a former vice president of Wasatch Backcountry Rescue, in Utah, and lead instructor with the American Avalanche Institute. “He will stand up in front of a crowd and call out everybody on their B.S. equally.”

Others maintain that his affiliation with brands like Mammut and ABS—for the latter, he designed a wireless group-deployment airbag system, useful if several people are swept away by a slide at once—make impartial research impossible. “Manuel always says that he’s an independent guy, but in fact he is not,” says Marcus Peterson, former general manager of Ortovox USA, a major beacon manufacturer. “He’s been a bomb

thrower for Mammut forever.”

His rivals’ feelings notwithstanding, lately Genswein has been trying to do something through ICAR that has never been done before: establish a set of standards covering every aspect of avalanche rescue. While snow-safety professionals have spent the past decade standardizing everything from the danger scale used in morning forecasts (low, moderate, considerable, and so on) to how accident reports are presented online, avalanche rescue remains a snake pit of opinions and local tradition. “Everybody thinks their way is the best,” says Dan Hourihan, a longtime ICAR delegate from the U.S. “We do it this way because this is the way Fritz did it! Well, where’s Fritz? ‘He’s dead!’”

For Genswein to establish a global standard, he needs his protocols to be endorsed by both the ICAR avalanche commission and the assembly of delegates, a notoriously political group comprised of member organizations from nearly 40 countries, including the U.S. To do that, he put together an ICAR working group that is examining all facets of avalanche rescue to determine which methods are superior. The list includes plenty of

Genswein's research-driven developments, including the V-shaped conveyor; the "slalom probing" search approach, which is used to locate avalanche victims who aren't wearing beacons; and a larger search-strip width for beacon-assisted rescues than is currently taught in some countries. The point, Genswein explains, is not to force his ideas on everyone else but to create a set of proven strategies.

Indeed, if ICAR officially recommends his protocols to rescuers and instructors around

the world, that could end up costing Genswein business. As a condition of his proposal, he has agreed to make his teaching materials publicly available. Still, Genswein thinks demand for his classes will continue. "Most recognize that the original is still better than the karaoke singer," he says.

ON A BLUEBIRD day in late March, I picked up Genswein for a ski tour around Quandary Peak, a 14,265-foot mountain near Breckenridge, Colorado. Though he visits the U.S. only two or three times a year, Genswein had been in Silverton and Durango to teach avalanche rescue. He had then traveled north to Breckenridge to train Flight for Life helicopter pilots on the use of Recco search devices, which help locate lost or buried subjects via reflectors sewn into their gear.

We met photographer Liam Doran at the trailhead and began skinning up an old mining road. I presumed that Genswein would look like one of his students—an alpha male, built like an old-growth spruce tree. But he's more like a well-packed snowball: five-foot-three, with a round head, stubby arms, and small hands. Some of his contemporaries refer to him as a Swiss gnome, but his size belies his climbing and backcountry abilities. He skis 70 days a year, he says, and you get the feeling that it's not nearly enough for him.

We stopped at a gate before entering the more open and exposed valley, with walls of rock and snow towering above us on three sides. Genswein took out his Pulse beacon to make sure it detected ours.

"Why do you use a Pulse?" I asked.

"Because I developed it," he said.

When he saw that I was wearing my beacon around my trunk, uncovered, he recommended that I put it in my pants pocket, with the screen facing inward. When I asked why, he said that he had studied the entire database of Swiss avalanche accidents, dating back decades, and found zero cases where the victim had lost his pants, then died of asphyxiation.

Genswein's breadth of knowledge and influence are even more unlikely when you consider that he has never been a professional rescuer. (He has, however, recovered three bodies, including one in 2001 that was buried for three months before the local rescue team summoned Genswein to help them find it.) The son of a clarinet-soloist mother and a doctor father, Genswein has an assertive approach and a high-pitched, almost car-

toonish voice that initially invited impersonation rather than respect. "He didn't fit in," says Dale Atkins, a longtime avalanche-rescue specialist in Colorado. "A lot of rescuers were like, 'Who is this guy saying we should be doing our job differently?'"

Genswein, who began backcountry skiing when he was five, broke ground as a researcher during mandatory service in the Swiss army, when he realized that his beacon

"EVERYBODY THINKS THEIR WAY IS THE BEST," SAYS DAN HOURIHAN, A LONG-TIME AVALANCHE RESCUER FROM ALASKA. "WE DO IT THIS WAY BECAUSE THIS IS THE WAY FRITZ DID IT.' WELL, WHERE'S FRITZ? 'HE'S DEAD.'"

didn't perform the same way every time he searched for a deep burial. He figured out the problem (users were positioning their beacons incorrectly), wrote a paper that was published by the Swiss Alpine Club, and started fielding requests to teach courses abroad. He was 19.

As Genswein taught, his reputation spread. He worked with Swiss avalanche gurus Jürg Schweizer, head of the Institute for Snow and Avalanche Research, and Werner Munter, a white-bearded guide known as the Avalanche Pope. His willingness to translate discussions into multiple languages gave him a voice at ICAR meetings. Owing to his electrical-engineering background—he apprenticed when he was a teenager and can troubleshoot virtually any rescue-related device—the company that developed Mammüt's beacons hired him to design what would become the Pulse, the first transceiver capable of detecting a victim's vital signs under the snow. They tested the device, which uses a highly sensitive accelerometer to capture muscle movement in the heart, by burying Genswein 25 times in up to six feet of snow. He stayed in place for an hour and 40 minutes per burial, breathing with an AvaLung. Genswein insisted that the Pulse, released in 2006, be equipped with an older analog function to deal with the most baffling problem in avalanche rescue: multiple burials in close proximity, which introduce signal overlaps that can be unscrambled only by changing the search beacon's angle and listening for deviations in tone.

THE THEORY of EVERYTHING

#8 Outside Magazine

BICYCLE HELMET LAWS ARE DANGEROUS

There's no question that helmets make cycling safer. A recent study by researchers at the University of

Arizona found that wearing one makes you 59 percent more likely to survive a collision. But according to many bike advocacy groups, laws requiring that adults wear helmets actually lead to more injuries.

How's that? Studies show that the laws deter people from riding, and the fewer riders there are on roads, the more car-bike accidents occur. Research backs up the idea that more cyclists on city streets reduces the number of collisions with automobiles, though exactly why is unclear. Anti-helmet-law groups believe it's because motorists become accustomed to sharing the road. "Nothing makes cycling safer than more cyclists," says Keegan Stephan, an organizer for New York City advocacy group Right of Way. "It changes the way drivers behave, and it changes the culture on the streets. Passing helmet laws that will deter cycling is one of the more detrimental things you can do." Not all biking groups oppose all-ages helmet laws, which are currently in place in some 50 U.S. cities. But as *The Wall Street Journal* reported last fall, several attempts to pass statewide legislation failed in the face of broader safety arguments. —REID SINGER



According to hardware-division chief Andres Lietha, Mammut's executives hoped that they might sell 60,000 Pulses over the device's lifespan. Instead, it has become one of the bestselling beacons on the market.

I'M SETTING a skin track above a stand of trees when Genswein suddenly asks me to stop. Despite the spring conditions, the snowpack has not consolidated into an isothermal structure, which is more uniform and predictable, and I got lazy with my route while moving across a small open slope.

"Don't take this as a personal criticism," Genswein says, "but if you would have made a switchback there, then come up right below these rocks—do you see that?—then we stay totally on top of this slope."

He's right. But I expected more venom. Among the traits Genswein is known for is his disregard for tact when evaluating another's shoddy performance. He attributes this trait to his Swiss upbringing. Kevin Christakos, a senior heli guide at Canadian Mountain Holidays, which has hired Genswein to train its guides since 1999, remembers how an attempt to translate Genswein's diction to "the redneck level" was received. "At one

point he said to me, 'You know, Kevin, you really shouldn't teach anyone anything about anything,'" Christakos says. Another time, when Christakos said to Genswein that he didn't believe one of Genswein's search strategies worked, Genswein started poking the six-foot-five guide in the chest. "It works!" he screeched. "You're just not applying it correctly!"

Genswein's daily teaching rate starts at \$600 in North America and \$800 for foreign militaries. He invests much of his income in research and says he always aims to prove a theory beyond any quantitative doubt, since he knows his critics will try to debunk it. To test his V-shaped conveyor shoveling method, for instance, he offered participants free lodging and food, as well as a multi-day, high-level avalanche course, in exchange for hard shoveling four or five times a day while he timed them and filmed their facial expressions to see when they got tired. The test cost him \$35,000, but the results were eye-opening: participants were able to remove nearly a third more snow per shoveler per minute, and rescue times were cut in half for victims buried in three feet of snow.

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A professional skier setting off a one-foot-deep slab on Mount Baker, in Washington

For the most part, those who once dismissed him at least listen now, though holdouts remain. Some of Genswein's stiffest resistance, ironically, is found in his home country. For years, he says, one of his friends at Alpine Rescue Switzerland forwarded him internal memos in which a senior official repeatedly made it clear that under no circumstances was anyone to hire Genswein to teach. "They viewed me as a predator," Genswein says, adding softly, "It hurt very much that they so excluded me."

Bruce Edgerly, vice president of Colorado-based Backcountry Access and a key player in the marketing-fueled beacon wars of the 1990s and early 2000s, once referred to Genswein in a since deleted blog post as "the Swiss avalanche rescue führer." Edgerly helped develop a competing shoveling technique to Genswein's V-shaped conveyor and downplays the multiple-burial search capabilities of his beacons. He claims Genswein "manipulates his numbers to meet his own objective, which is to sell high-level avalanche courses to professionals." When asked why he has taken four of Genswein's courses,

BREWERS ARE OUR MOST CREATIVE CONSERVATIONISTS

Among the countless industries affected by the California drought is craft brewing. Beer is water intensive—it takes seven barrels of water to make a barrel of suds. So it's no surprise that after four years of paltry precipitation, some of the Golden State's 570 craft breweries—the most in the country—are coming up with innovative approaches to conservation. In August, Anheuser-Busch-owned Shock Top, maker of a Belgian white ale, announced that it would fund water-saving projects through crowdfunding site Indiegogo. It's first investment: \$100,000 to a startup that produces rubber bricks to put in toilet tanks, reducing the amount of water used with every flush. But that effort was outdone in October by Mavericks Brewing in Half Moon Bay, which as a marketing stunt created an IPA made from recycled wastewater, or gray water, supplied by NASA. The effort was designed to demonstrate the viability of recycled water, which is barred from use in commercial beverages despite being safe to drink. "If I can brew a great beer from gray water," says Mavericks founder Lenny Mendonca, "maybe larger water-recycling programs will move forward."

—GRAHAM AVERILL

Edgerly replied, "To make myself aware of his information."

Whether there are enough critics to block the protocols from being endorsed by ICAR remains to be seen. Genswein knows the process is political and that bureaucracy slows almost every decision to a crawl. Patience is key. "Too much pressure can be counterproductive," he says. He pauses, then adds, "Too much Manuel Genswein can be counterproductive."



THE LATE-MARCH sun bakes our cheeks as we crest a ridge below the north face of Quandary Peak. The snow looks wind scoured and crusty in the chute I'd hoped to ski, so Genswein, Doran, and I scan the upper basin for an alternative. We decide to skin toward the east face of Fletcher Mountain, a 13,951-foot pyramid at the head of the valley.

Genswein, normally swift on skins, is slowed today by a fever and back pain, the latter from a paragliding accident 21 years ago that fractured three vertebrae and almost paralyzed him. Doran and I push ahead to inspect a north couloir that appears to be in pristine condition, with six inches of dry powder overlaying a firm base. Genswein urges us to climb and ski it while he waits below. "Go now!" he shouts. As much as we want to, it doesn't feel right to separate the group, so we strip off our skins and prepare to ski an open bowl just below the couloir.

Later, Genswein will bring up ski touring's fatality rate—1 in 100,000 on a slope with minimal risk—and detail how those odds rise or fall with each decision you make. "This is one of the hard things in this field," he says, suddenly animated. "Because the statis-

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Genswein with some of the avalanche gear he helped develop

tical likelihood to get caught is so low, there are accidents that you look at and think, How stupid, how could you imagine to ski this

slope in these conditions?"

Then, just as quickly, his voice softens almost to a whisper. "But there are other accidents where you look at the map and you look at the conditions and you talk to the survivors, and you realize, here, I probably would have gone as well."

As I stand atop the run that will supply today's adrenaline fix—and double our perceived fatality rate to 1 in 50,000, due to the steeper pitch—I watch Genswein link perfect S-turns through the powder below, tight and uniform to the final arc. Then I push off myself, floating downhill with a joy born of gravity and freedom and, if I'm being honest, the knowledge that Genswein is standing at the bottom, just in case. **1**

DEVON O'NEIL COWROTE THE LONGEST RUN, ABOUT SKIER RAINER HERTRICH, AVAILABLE FROM AMAZON.COM.

FRESH LOOK

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EVERYTHING IS A BARGAIN AND STILL NO ONE IS HAPPY



BY Will Egensteiner

MOSS TENT WORKS STARLET (1983)

\$350 (\$836 in 2015 dollars)

(1) The ripstop nylon shell was tough but heavy, making for a 4.5-pound tent in your pack. (2) Just a single door on this two-person design. (3) Setup required two aluminum poles, taking up more space and weight than the Hubba Hubba's one.

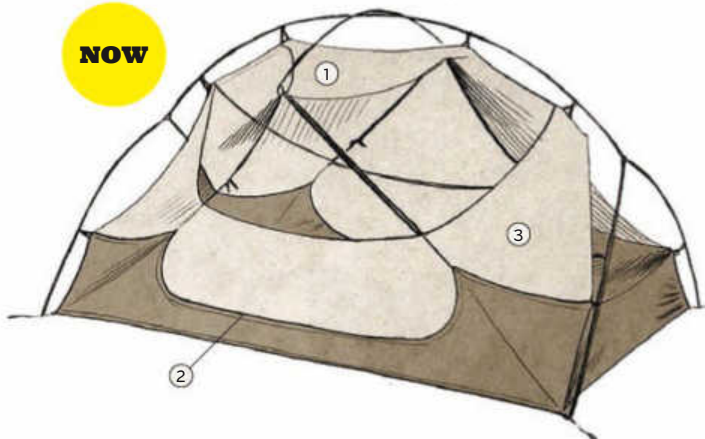


THEN

MSR HUBBA HUBBA NX

\$400

(1) Micro mesh improves ventilation and drops the Hubba Hubba to almost a pound lighter than the Starlet. (2) Two doors means no tripping over your tentmate to exit. (3) Polyurethane and DWR coatings cause moisture to bead up and roll off.



NOW

LANGE (1965)

\$165 (\$1,246 today)

(1) The low-top design afforded minimal support. (2) Bob Lange developed the lightweight metal buckles himself; they were much easier to close than the lacing systems they replaced. (3) Lange made the first boots with plastic shells, and they were far more responsive than the leather models of the time.



THEN



NOW

LANGE RS 140

\$900

(1) Cork padding in the liner retains the shape of the skier's foot. (2) Today's metal buckles feature latches for durability and firm claspings. (3) The top-of-the-line shell is made from an extremely dense, high-grade plastic that delivers better energy transfer and flex at only five pounds per boot.



THEN

EARLY WINTERS GORE-TEX PARKA (1976)

\$80 (\$334 today)

(1) Gore's game-changing synthetic membrane had billions of pores that were too small to allow water droplets to penetrate, yet were large enough for vapor to escape. Outer fabric added protection, and inner lining boosted comfort. (2) Other than that, it was a pared-down piece of rain gear.



NOW

MARMOT PRECIP

\$100

(1) Marmot's NanoPro technology lowers construction costs by utilizing only one layer of fabric with a weatherproof finish. (2) Pit zips dump excess heat. (3) Taped seams add structural integrity and seal punctures from the stitching process.

HEAD STANDARD (1950)

\$85 (\$839 today)

(1) With a pointed tip, a flat tail, and shallow side-cut, this ski was great for flying fast in a straight line.

(2) The Standard was the first laminate ski with metal edges, a feature that gave it better hold through turns.

(3) A plywood core sandwiched between sheets of aluminum, then covered by a plastic topsheet, made this a breakthrough feather-weight ski in the day of solid-wood boards.

ATOMIC VANTAGE 90 CTI

\$725

(1) A rounded tip and tail with modest rocker boost control in varied terrain.

(2) The addition of deep sidecut makes the Vantage an ideal all-mountain ski, happy on groomers and in deep powder. (3) A titanium insert acts as a backbone, lending stability. (4) The poplar-ash core, encased in woven carbon mesh, adds rigidity and strength.

THEN



NOW



NEW BALANCE TRACKSTER (1960)

\$16 (\$129 today)

(1) A saddle on the upper of the 10.9-ounce Trackster ensured that the laces cinched securely around the midfoot.

(2) The rippled sole absorbed impact and staved off shin splints, but it was designed primarily for forward motion.

(3) The seamless leather upper prevented chafing.

NIKE ZOOM WINFLO 2

\$90

(1) Forefoot mesh vents clammy feet and cuts the weight down to 9.7 ounces per shoe. (2) The waffle-patterned outsole offers multidirectional traction on a greater variety of surfaces.

(3) EVA foam, now commonplace in running-shoe midsoles, cushions the wearer's foot on hard surfaces.



THEN

SPECIALIZED STUMPJUMPER (1981)

\$750 (\$1,962 today)

(1) Straight steel frame tubes offered supreme durability but pushed the bike's total weight to 34 pounds.

(2) Cantilever brakes, the norm for the era, took a while to slow

you down, especially when the rims got slick on rainy-day outings.

(3) The lack of shocks made for a rough ride, though the curved front fork absorbed some of the chatter.



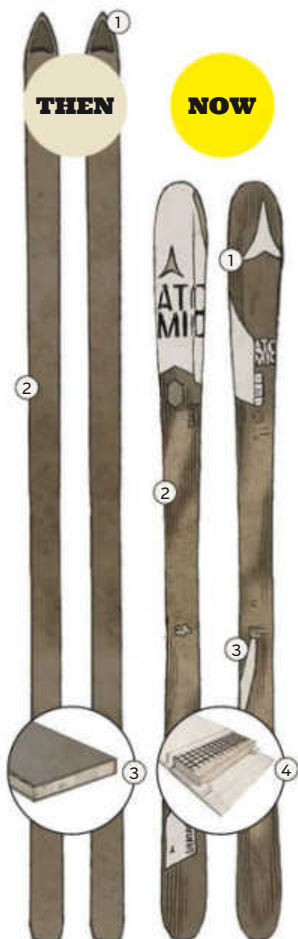
NOW

SPECIALIZED ROCKHOPPER COMP 29

\$950

(1) The aluminum top tube narrows through the middle to cut weight, keeping the bike a light 30 pounds. (2) Hydraulic disc brakes have superior stopping power regardless of the

conditions. (3) The Sun-tour front suspension fork has 100 millimeters of travel and locks for climbing and road riding. (4) Better-engineered tires with deeper tread provide grip on trails.



THEN

NOW



The endless cascade of nutritional information—
or fish, and more—makes the simple goal of a
and farmers to get the ultimate rundown on how

EATING RIGHT THE WORLD

about localism, vegetarianism, veganism, organic food, the environmental impact of eating meat, poultry, healthy, sustainable diet seem hopelessly complex. Tim Zimmermann talked to scientists, chefs, you should fuel up.

T C A N S A V E





“Tell me what you eat and I will tell you what you are.” That’s what the French lawyer Jean Anthelme Brillat-Savarin, who happened to have a deep love of gastronomy, wrote in 1825. A century later, a diet-hawking American nutritionist named Victor Lindlahr rendered it as: “You are what you eat.” I propose revising it further: Tell me what you eat and I will tell you how you impact the planet.

Most of us are aware that our food choices have environmental consequences. (Who hasn’t heard about the methane back draft from cows?) But when it comes to the specifics of why our decisions matter, we’re at a loss, bombarded with confusing choices in the grocery-store aisles about what to buy if we care about planetary health. Are organic fruits and vegetables really worth the higher prices, and are they better for the environment? If I’m a meat eater, should I opt for free-range, grass-fed beef? Is it OK to buy a pineapple flown in from Costa Rica, or should I eat only locally grown apples?

The science of food’s ecological footprint can be overwhelming, yet it’s important to understand it. For starters, in wealthy societies food consumption is estimated to account for 20 to 30 percent of the total footprint of a household. Feeding ourselves dominates our landscapes, using about half the ice-free land on earth. It sends us into the oceans, where we have fished nearly 90 percent of species to the brink or beyond. It affects all the planet’s natural systems, producing more than 30 percent of global greenhouse gases. Farming uses about 70 percent of our water and pollutes rivers with fertilizer and waste that in turn create vast coastal dead zones. The food on your plate touches everything.

“If you look at the heavy-hitter list of global-scale changes that are human induced, how we feed ourselves is invariably near the top,” says Peter Tyedmers, a professor at Dalhousie University’s School for Resource and Environmental Studies (SRES) in Halifax, Nova Scotia, who has been studying the world’s food systems for 15 years. “But the great thing about food is that we have choices, and we have the opportunity to effect change three times a day.”

So what does a sustainable diet actually look like? I’ve thought a lot about my food choices and became a vegan a few years ago, but I still don’t know all the answers. So I set out to find them.

I didn’t go hunting for a crazed notion of perfection. I was simply looking for an

attainable way to eat—whether you’re a vegan, a vegetarian, or an omnivore. Here’s what I discovered.

PALEO IS STUPID

One of my first stops is with Tyedmers. On a surprisingly warm evening for September in Halifax, he and dozens of SRES students are gathered on the back deck of a modest clapboard house to celebrate the start of the term. The only strange thing is what I see on many plates: hamburgers.

Admittedly, chicken and veggie burgers are also available. But the fact that an environmental-studies cookout features beef—perhaps the most vilified of all foods

water consumed is used to grow grain to feed livestock. A 2013 United Nations Food and Agriculture Organization study estimated that livestock accounted for 15 percent of greenhouse-gas emissions, about the same as the entire global transport sector. Other analyses, which argue that the UN estimate doesn’t adequately account for things like the CO₂ produced by the respiration of tens of billions of farm animals, estimate that livestock might be responsible for up to 51 percent of global emissions. “Meat is heat,” environmentalists like to say.

The type of meat you eat matters, too. A 2011 life-cycle analysis by the Environmental Working Group, a Washington, D.C., non-profit, ranked the climate impact of various

meats. Lamb was the worst of fender: for every one kilogram (or 2.2 pounds) consumed, the EWG estimates that 86.6 pounds of greenhouse gases are produced. Beef was next, at 59.5 pounds of greenhouse gases. Then pork, at about 26.5 pounds. Chicken, at 15.4 pounds, is the most climate-efficient farmed meat.

Meat is equally disproportionate in its thirst for water. Beans and lentils require five gallons of water per gram of protein produced, chicken nine gallons, and beef 29.6.

Reductions in meat consumption can deliver outsized

THE PLANETARY IMPLICATIONS OF THE PROTEIN-OBSESSED PALEO DIET PRODUCES AN IRE RARELY SEEN IN PROFESSORS OF THE ENVIRONMENT. “THAT’S AN INSANE WAY TO EAT,” TYEDMERS SCOFFS. “THEY SHOULD BE CLUBBED.”

benefits to anyone trying to eat more sustainably. “The question isn’t beef or no beef,” says Tyedmers, who eats it about five times a year. “It’s the right quantities of it. There are grasslands on the planet that can support beef, but we need to focus on portions and frequency.”

Before I arrived, Tyedmers pointed me to a few landmark studies, the results of which are hard to ignore. Eighty percent of the world’s agricultural lands are allocated to animals, either for pasture or to produce food for them. More than 20 percent of all

The average American currently packs away a staggering 185 pounds of meat a year, the equivalent of more than eight ounces a day. Yet the USDA’s 2010 dietary guidelines recommend just 3.7 ounces of meat per day—



about a palm-size burger—which comes out to around 84 pounds per year. Eating the recommended amount would mean a 55 percent cut in meat consumption.

Here's a sense of what the planet might reap in return. A 2015 study conducted by the journal *Frontiers in Nutrition* concluded that a diet that is vegetarian five days a week and includes meat just two days a week would reduce greenhouse-gas emissions and water and land use by about 45 percent.

Does eating grass-fed, free-range meat let you off the hook? Not really, because meat takes a toll no matter how it's raised. Studies actually show that a factory-farm animal emits fewer greenhouse gases than a free-range one, because it lives a shorter life. But Greg Fogel, a senior policy specialist at the National Sustainable Agriculture Coalition, points out that factory farms in the U.S. produce 13 times as much sewage as the entire human population and that environmental impact is about more than greenhouse gases. "The meat you do eat should be grass-fed meat from managed grazing operations," he says. "Rotational grazing systems recycle manure as fertilizer, improve wildlife habitat, and enhance plant root systems, increasing soil quality, water infiltration and flood control, and carbon sequestration."

Right about now you might be thinking, Mmmmm, bacon. You might also be thinking, If I don't eat much meat, how will I get enough protein? Not to worry. "We don't need nearly as much animal protein in our diets as we currently enjoy," Tyedmers says.

He's right. The average American should consume about 0.36 grams of protein per pound of body weight per day, which works out to 70 grams of protein a day for a man. Recommendations for athletes range from 98 grams of protein a day for a weekend warrior to as much as 176 grams for competitive endurance athletes.

These aren't difficult targets to hit. In the U.S., even vegetarians get about 27 percent more protein than the recommended daily allowance. Omnivores really pack it in, eating 60 percent more protein than a body needs. The extra protein is simply excreted, which Tyedmers derisively refers to as "pissing sustainability away." The planetary implications of the protein-obsessed paleo diet, in particular, produces an ire rarely seen in professors of the environment—or Canadians.

"That's an insane way to eat," Tyedmers scoffs. "They should be clubbed."

TAKE THE BAIT

Tyedmers and I move on to the topic of seafood. He stands and starts rummaging through a box of old fishing gear he has

accumulated over the years while studying fisheries. “When it comes to nitrogen and phosphorous, greenhouse gases, and other global-scale phenomena, absolutely most seafood is much better than most terrestrial animal production,” he says.

Any assessment of seafood sustainability has to involve a careful look at stock management and how much bycatch is involved in the fishing method. Sorting through all the data is hugely complicated. I wrote about sustainable seafood for this magazine in June 2015, and I recommended using the Monterey Bay Aquarium’s Seafood Watch app when considering what’s on offer at the fish counter or when dining out. The app uses a clear rating system to rank sustainability and does the hard work for you.

But Seafood Watch’s ratings don’t yet include climate impact, which adds up. Seafood caught by bottom trawling or from pots and traps, for example, burns a lot of diesel as the boats work back and forth over a fishing ground. (Bottom trawlers also tear up the seabed.) So if you’re a fan of trawled Norwegian lobster, sold as scampi, you’re tucking into a hard-shelled climate bomb that exceeds most beef in terms of greenhouse-gas emissions.

As it happens, the seafood with the smallest carbon footprint is frequently the seafood that’s best to eat if you’re looking to reduce pressure on wild fisheries. Mussels, the only animal protein I still eat, have more of a carbon “toeprint,” at one pound of greenhouse gases per pound of mussels. Clams and oysters are similar, and sardines are a climate-friendly superfood. Mackerel, herring, and

don’t filter and recirculate the water, like net pens in the ocean, are on average comparable to poultry and pork in terms of greenhouse-gas emissions. Land-based recirculating aquaculture, with its climate-controlled facilities and electricity demands, can be more than twice as greenhouse-gas intensive as aquaculture that doesn’t recirculate. So catfish and tilapia farmed in ponds or net pens are more climate-friendly than the same fish from recirculating farms. How about consumer-favorite farmed salmon? According to EWG’s calculations, farmed salmon is comparable to pork’s somewhat hefty footprint.

Weighing all the nuances can make seafood selection a head-scratching process of trade-offs, even for an environmental-studies professor. “For every pound of Nova Scotia lobster I buy there was a pound of bait used, and that was mostly herring. And that herring was better food for me and would have fed more people,” Tyedmers tells me, noting that some lobster fisheries in the U.S. use three times as much bait. “Then you throw in the diesel fuel. Does that mean I don’t eat lobster? No, but I do it with consciousness and intent, and on a special occasion.”

Good advice. Or stick to mussels.

VEGANS AREN’T PERFECT, EITHER

Clearly, eating less meat has big environmental payoffs. But what about not eating it at all? I’d never crunched the numbers to find out how much more climate-friendly a plant-based diet really is. The results are telling.

For example, in the *Frontiers in Nutrition* study, researchers compared the greenhouse-gas, water, and land footprints of a balanced 2,000-calorie vegetarian diet, including eggs and dairy, with those of a balanced 2,000-calorie omnivore diet that included one serving of meat per day: a 5.3-ounce steak. The vegetarian diet reduced greenhouse-gas emissions by 63 percent and required 61 percent less land and 67 percent less water.

Another study, in the *European Journal of Clinical Nutrition*, also compared an omnivorous diet to a vegetarian one. It considered a broad array of environmental impacts beyond climate change and land use—including cancer rates, effect on the ozone layer, and waterway pollution—to produce a more complete model. It concluded that the vegetarian diet had just 64 percent of the environmental impact of the omnivore diet.

How much of a bump can you get from giving up eggs and dairy and going vegan? Big enough to take seriously. The 2015 *Frontiers in Nutrition* study, for example, estimated that a vegan menu has a climate footprint 31 percent smaller than the vegetarian menu and 74 percent smaller than the omnivore menu, and a land footprint 7 percent smaller than the vegetarian and 64 percent less than the omnivore. It also reduces water demand by 9 percent over the vegetarian and 70 percent over the omnivore.

THE THEORY of EVERYTHING #12 Outside Magazine

DISCOMFORT IS THE SECRET TO HAPPINESS

Countless products promise to improve our lives by making them easier. (Think laptops, Boa closures, child leashes.) But a new class of industrial designers want to achieve that end by making things harder. That’s why Berlin-based Weng Xinyu, 28, created a lamp that switches on only when you slot your phone into the base, derailing sleep-disrupting late-night screen time. Another example: sitting is bad for you, even if you’re using an ergonomic office chair. So Benoît Malta, a 25-year-old French industrial designer, created a seat that has only two legs, forcing you to engage your core to stay upright while you sit. And because driving to work doesn’t make you (or the planet) nearly as happy as riding a bike, 32-year-old Matthias Laschke, a German industrial designer, devised a wall-mounted rack with spots for two keys—one for your car and one for your bike lock. Grab the car key and it drops the other one at your feet—a not-so-subtle suggestion that you reconsider your mode of transportation. “You don’t need extra brainpower to know that using the bike is better for you physically,” says Laschke. “It’s about creating enough friction so that you’re confronted with this decision every morning.” —CHRIS COHEN

FOOD AUTHOR MARK BITTMAN DOESN’T WANT CONSCIENTIOUS EATERS TO FEEL IT’S ALL OR NOTHING. “I’M NOT A VEGAN,” HE SAYS. “I DON’T THINK PEOPLE NEED TO BE VEGAN. WE COULD EAT 90 PERCENT LESS MEAT AND BE FINE.”

anchovies are also relatively easy on the climate—if they aren’t caught by a trawler. If you can’t stand the smaller, oilier fishes, U.S.-caught Alaskan pollock, which comes from a reasonably managed fishery, has a modest climate impact, making it the real chicken of the sea.

Aquaculture, or fish farming, is equally method dependent. Aquaculture systems that

Vegetarians and vegans shouldn't feel too righteous or complacent, however. When we stop eating meat, we turn to other forms of protein like nuts, legumes, and grains, and these have an environmental footprint worth considering, too.

Take the increasingly popular and thirsty almond. It notoriously takes a gallon of water to produce a single almond, and we're eating seven times as many now as we did in 1972. Drought-plagued California produces 99 percent of American almonds, so bingeing on almonds and almond milk can be a water-intensive approach to fueling your body. (Good alternatives include coconut and hemp milk.) Nuts in general are an especially water-intensive way to get protein, requiring more than six times the water needed to produce equivalent protein from black beans, lentils, and chickpeas.

Still, perspective is important. Almonds require less than half the water per calorie of beef, and livestock feed and grazing in California sucks up more than twice the water used by almond and pistachio growers. Other healthy nonanimal calories, from cereals, legumes, roots, fruits, and vegetables, require about one-fifth the water used to produce the same number of animal calories.

Plant-based protein choices also carry different environmental costs. Wheat accounts for one-fifth the greenhouse-gas emissions of water-thirsty rice per gram of protein. Legumes are even better, at one-quarter the emissions of wheat. Being thoughtful about protein alternatives yields even more environmental payoff. Lentils and chickpeas, for example, are better than soybeans at fixing nitrogen in the soil and help you avoid soy's GMO issues. And quinoa is packed with protein and grows well in a variety of soils.

Another fast-growing category of plant-based protein is meat substitutes—or meat methadone, as I think of them—often made of pea and soy proteins. I have tried most of them and tend to think that you can cook better food by delving into cuisines like Indian and Thai, which offer delicious recipes based on vegetables. But for anyone who simply can't get beyond a craving for something meat-like, substitutes that contain no animal products produce about one-third the greenhouse gases of poultry.

While it's clear that eating a more vegetarian or vegan diet takes pressure off the planet's resources, former *New York Times* food columnist Mark Bittman doesn't want



←
Blue Hill chef
Dan Barber
in New York

ment, extensive cover crops, and natural fertilizer like manure.

Nichols is wearing jeans and a T-shirt, and her brown hair is pulled back in a loose ponytail. She ushers me into a nondescript cinderblock shed, where the air is pungent with the smell of dirt. Nichols rummages through a pile of clear three-foot-long tubes containing core samples from Rodale's farming-systems trial, and she arranges two of them—one organic, the other conventional—next to one another. The tops of the tubes, where the soil comes from the surface, are dark and chocolatey in color. This is the topsoil, Nichols explains, the prime growing layer known to scientists and farmers as the A horizon. She points out that the A horizon in the organic soil

extends significantly deeper than in the conventional-soil sample, adding that there is more earthworm and other biologic activity throughout most of the organic-soil tube.

It takes the planet about 1,000 years to build an inch of topsoil. Rodale's organic methods are changing that equation. "The soil's got more microbial activity, and we're getting organic matter deeper down into it," Nichols says. "We're building our A horizon. We grew three inches in 35 years."

YOU MIGHT HAVE TO SPEND MORE

I live with a wife who's a carnivore and two kids who are vegetarian, but the biggest debate in my household is over whether to buy organic or conventional fruits and produce. Based on vague notions that organic is better for the environment and aversions to the idea of herbicide- and pesticide-coated food, I am willing to pay the higher price for organic. My wife, Ilana, isn't.

To find out if my organic preferences are worth it, I head to southern Pennsylvania, to the rolling 333-acre farmlands of the Rodale Institute, home to the longest-running side-by-side, organic-versus-conventional-farming trial in the U.S., to meet with Kristine Nichols, a soil microbiologist and Rodale's chief scientist.

Organic farming, Nichols tells me, is really about the health of the soil and the ecosystems producing our food. Nichols wants to show me the difference between soil from conventional agriculture, which uses chemical fertilizers and pesticides, and soil from what Rodale calls regenerative organic agriculture, which uses natural pest manage-

ment, extensive cover crops, and natural fertilizer like manure.

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This is an important achievement, given that an estimated 90 percent of U.S. cropland loses soil at a rate 13 times what's sustainable. "Feed the soil, not the plant," organic farmers like to say. Apparently, it works.

Nichols then takes me out to the farming-systems trial to see late-summer conventional corn next to late-summer organic corn. For the conventional side of the trial, Rodale uses the most up-to-date techniques, which include GMO varieties and the same carefully calculated quantities of fertilizer and herbicide that commercial farmers use. Still, the conventional corn is not looking so good. The leaves are yellowish, and the plant has reddish blotches, signs of phosphorous and nitrogen deficiency. Heavy spring rains washed a lot of the fertilizer away, followed by a hot and dry August.

The organic corn just a few plots away looks greener and more vibrant. Instead of synthetic fertilizer, cover crops have been used to feed the soil with carbon and nutrients and act as a weed-deterring mulch layer. The richer soil, and the more active relationship between the corn plant and the A-horizon microbial world, helped the corn

weather the dry summer better. And Rodale's data shows that its organic corn yields 31 percent more in drought conditions than its conventionally grown corn, which is important in a climate-changing world.

Rodale's organic growing methods deliver other environmental benefits. They use 45 percent less energy and produce 40 percent fewer greenhouse-gas emissions than the conventional growing systems. Other studies confirm the good news. One concluded that an omnivore diet of organic meat and vegetables has an environmental footprint 41 percent smaller than that of a conventional omnivore diet, and an organic vegetarian or vegan diet gets roughly the same benefit. When you consider that the estimated environmental and health-care costs of pesticide use in the U.S. every year is in the billions, I start to feel pretty good about my side of the organic-versus-conventional marital debate.

Finding an abundance of organic options usually means shopping at a higher-end grocery store or a farmers' market, or buying a CSA share from a farm that uses regenerative organic practices. Whole Foods is trying to make sustainably farmed products easier to identify by rolling out Responsibly Grown ratings of Good, Better, and Best for fruits, flowers, and vegetables. Products that meet the Certified Organic standard of the USDA are automatically granted a Good rating but have to meet additional criteria to move up the scale.

"Responsibly Grown is designed to give our shoppers more information about the products they're buying," says Liz Burkhart, a spokeswoman at Whole Foods. "This includes areas like water conservation, energy use, and farmworker welfare."

As for the higher prices of organic, I deal with the premium by buying smaller quantities and cooking moderate portions, which is beneficial to my wallet and to my family's calorie count.

BANANAS ARE WELL TRAVELED

While what you eat is important, how it gets to your plate matters, too. One morning before dawn, I head into an industrial zone of Capitol Heights, Maryland, where I find Zeke Zechiel overseeing the morning deliveries for Washington's Green Grocer. Zechiel used to be a nightclub owner, but 21 years ago he and his wife, a chef, decided they wanted to

offer their community a better way to buy quality produce. Washington's Green Grocer delivers subscribers a weekly box of organic (or conventional) fruits and vegetables. I find it a convenient way to buy organic.

Zechiel is 51, wearing cargo shorts, a T-shirt, and Keen sandals. He tries to buy as much as he can from farms within a few hundred miles of him. I see lots of boxes from the Lancaster Farm Fresh Cooperative in Pennsylvania. But I also see Mexican avocados, California brussels sprouts and cauliflower, and organic bananas imported from Central and South America.

"To sustain the company, there are certain things people want to have," he says. "If we don't have them, they won't use us."

Zechiel worries about the food miles required to give his subscribers the fruits and vegetables they expect. To address that concern, he launched a local-only box, which is now bought by about 20 percent of his 3,500 customers and is his fastest-growing offering. But he ruefully admits that he can't make it both organic and local year-round, which he calls the holy grail, because it's hard to get a wide selection of organic fruits from the wet, pest-prone mid-Atlantic region.

"If you want to eat local and organic year-round, you have to stock up and make jams

IN THE U.S., 40 PERCENT
OF FOOD—WORTH AN
ESTIMATED \$165 BILLION—
IS THROWN OUT EVERY YEAR.
IT'S AN ENVIRONMENTAL
TRAGEDY. THE AVERAGE
FAMILY OF FOUR TRASHES
TWO MILLION CALORIES A
YEAR, WORTH NEARLY \$1,500.

and freeze or can stuff, which is an enormous effort," he says. "It's really hard to find something so committed."

Even his dedicated local-box customers often add on imported bananas. "People just gotta have their Saturday smoothies," he says.

Food miles and the greenhouse-gas emissions they cause aren't easy to understand. So much depends on the efficiency of the transport network. Anything flown in—say, fresh salmon from Alaska or cheese from Europe—arrives with a sizable climate footprint. But bananas or oranges packed tightly onto a container ship or a large truck do not. How do you compare a fully loaded semi

driven cross-country from California with a local grower's pickup truck that may have rolled only 100 miles to a farmers' market with a few boxes in the bed?

Still, according to one analysis I found, buying local can reduce the impact of vegetable production by 10 to 30 percent. Other researchers have calculated that produce moving through the national transportation network that supplies large grocery stores travels an average of about 1,518 miles and emits five to seventeen times the greenhouse gases of regional and local food distribution. In contrast, locally sourced foods travel an average of just 45 miles.

So it makes sense to buy local whenever possible, another reason to spend time at the nearest farmers' market. If you're really dedicated to sustainable eating, that means eating seasonally as well. No more grapes and strawberries from Chile in February. I can only hope Zechiel will start selling local canned peaches to get me through winter.

YOU'RE THROWING AWAY TOO MUCH FOOD

No matter where you come down on meat, organic, and shopping locally, there are two powerful sustainability strategies you can put to work right now. The first is to eat less. If the average omnivore, who eats around 3,500 calories a day, instead ate a diet closer to his basic nutritional requirement of 2,500 calories, he would likely reduce his environmental footprint by about 30 percent. An active person who works out daily needs closer to 2,800 calories, yielding a roughly 20 percent cut.

The second strategy: waste less. In the U.S., 40 percent of food—worth an estimated \$165 billion—is thrown out every year. It's an environmental and social-policy tragedy. According to the USDA, which in September announced an initiative to try and cut American food waste in half, the average family of four trashes two million calories a year, worth nearly \$1,500. As a result, 25 percent of America's water is used to produce food that is never eaten, and an estimated 28 percent of the planet's agricultural land is used to grow food that ends up in the garbage. Food is the single largest solid-waste component of America's landfills—an estimated 80 billion pounds—and emissions from it are equivalent to the greenhouse-gas output of 33 million cars.

Wasting resource-intensive meat and seafood is particularly hard on the planet, yet consumers throw away an estimated 40 percent of the fresh and frozen fish they buy, 31 percent of the turkey, 25 percent of the pork, 16 percent of the beef, and 12 percent of the chicken. Peter Tyedmers says that



consumer demand for fresh seafood leads to a lot of waste at the fish counter. There, if it isn't sold by a certain date, it gets tossed.

"I have thrown out halibut steaks. They get lost in the fridge," he says ruefully. "If you buy that halibut steak frozen, it just stays in the freezer."

Restaurants and grocery stores are doing more to donate excess stock to food banks, and national food-service operators such as Aramark are discovering that innovations—like removing trays from cafeterias, which make it too easy to load up—can lead to dramatic reductions in waste. But how we personally shop and handle food at home is by far the biggest source of food waste, accounting for an estimated 47 percent. Restaurants are the next biggest, at 37 percent.

To combat this, I shop more often, buying for a day or two at a time instead of a week, so that less food gets lost in a packed refrigerator. I often ignore expiration dates, and I derive distinct pleasure from cooking up hashes, soups, and curries using all the leftovers I find on the edge of going bad. I have become the food-waste equivalent of the person who goes around turning everyone's lights off. It can be annoying, but it works.

THE FUTURE TASTES GOOD

I know all this conjures an image of an envioscolding hippie living on lentils. But fear not: eating more sustainably can be delicious.

For reassurance, I check in with Dan Barber, a dynamo chef and a seriously deep food thinker. First at his restaurant Blue Hill in New York City, and then at Blue Hill at Stone

SUSTAINABILITY IS A LITTLE LIKE RELIGION: WE'RE ALL STRIVING FOR AN IDEAL, BUT IT'S DIFFICULT, IF NOT IMPOSSIBLE, TO ACHIEVE PERFECTION. WE SIN A LITTLE HERE. WE SIN A LITTLE THERE. BUT A FEW SIMPLE ADJUSTMENTS HELP A LOT.

Barns, which he opened near Tarrytown, New York, in 2004, Barber has been on a quest to create a more sustainable menu and prove that it can be extraordinary. That led him to a profound appreciation for the natural productivity possible at his family's 138-acre New England farm, called Blue Hill, using regenerative organic methods. Today the farm rotates and produces a variety of crops and vegetables and uses livestock like cows, chickens, and pigs to spread and work nutrients into the soil.

Barber sees eating and food production as a negotiation with the landscape. What can it reasonably provide? How does a chef make the best use of everything it offers? How can the foods we eat sustain and build its fertility? When he looked at his menus and his cooking through that lens, he realized that he needed to reinvent the architecture of the American plate. Instead of a massive chunk of animal protein at the center flanked by a few vegetables, Barber envisioned the reverse. Vegetables and legumes or grains would be the headliners at the center, and animal protein would be the judicious accompaniment. Imagine a carrot steak, Barber

proposed, with a side of braised second cuts of beef. He calls this the "third plate," which became the title of his excellent book about his journey. Diners and restaurant reviewers have been ecstatic.

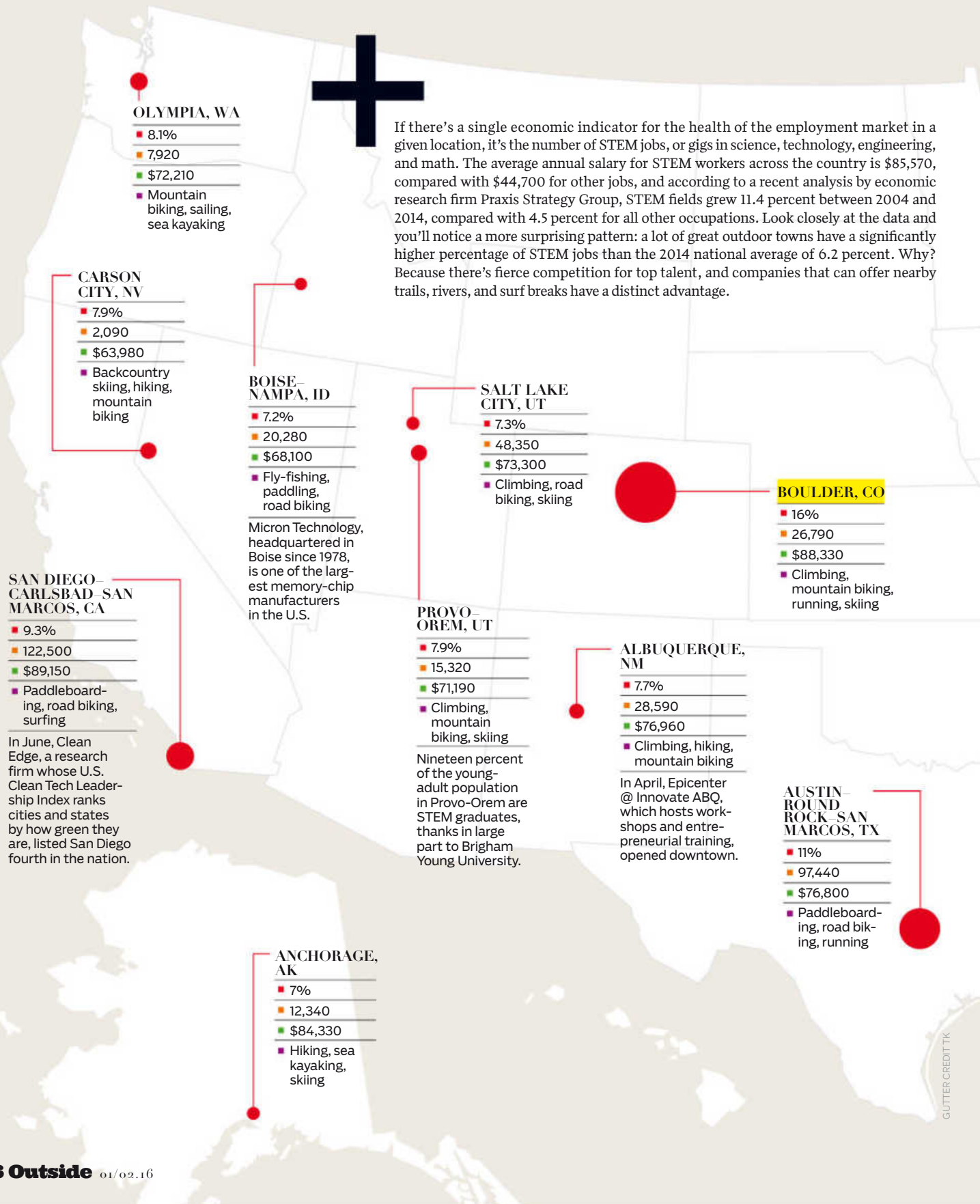
"It's not to say you can't enjoy a steak, but we really need to think hard about meat," Barber says. "You can take very small amounts of meat and get great satisfactory umami"—or savory flavor.

It's a hopeful vision, and the rest of the world is trying to catch up. Near the end of my visit in Halifax, Tyedmers and I eat lunch at Lion and Bright, an organic restaurant in the North End. I have an eggplant, tomato, and green onion curry wrap; Tyedmers orders the chili con carne. "I'm a sucker for good chili," he sighs. I ask Tyedmers why, given how much he knows about the environmental impacts of meat, he continues to eat it.

"If every male on the planet ate the way I do, we would have less of a problem, but we would still have a problem," he says. He pauses, then says that it doesn't make sense to focus all your sustainability efforts on just one facet of life, like eating. What matters is the overall footprint of the choices you make. He tells me that when he got married, he was apprehensive about having children, because population is such an engine of environmental crisis. His wife wanted the experience of raising children. In the end, they settled on one child.

It's a good point. Ilana and I have two children, and whatever choices I make with regard to the sustainability of my diet or lifestyle will likely pale next to that second child's life of consumption. Tyedmers made a hard choice when it came to reproduction but still eats meat. I made a hard choice to stop eating meat but had two children. I can never regret having a beautiful second child in my life, but I have to confess that Tyedmers's choices are **continued on page 98** →

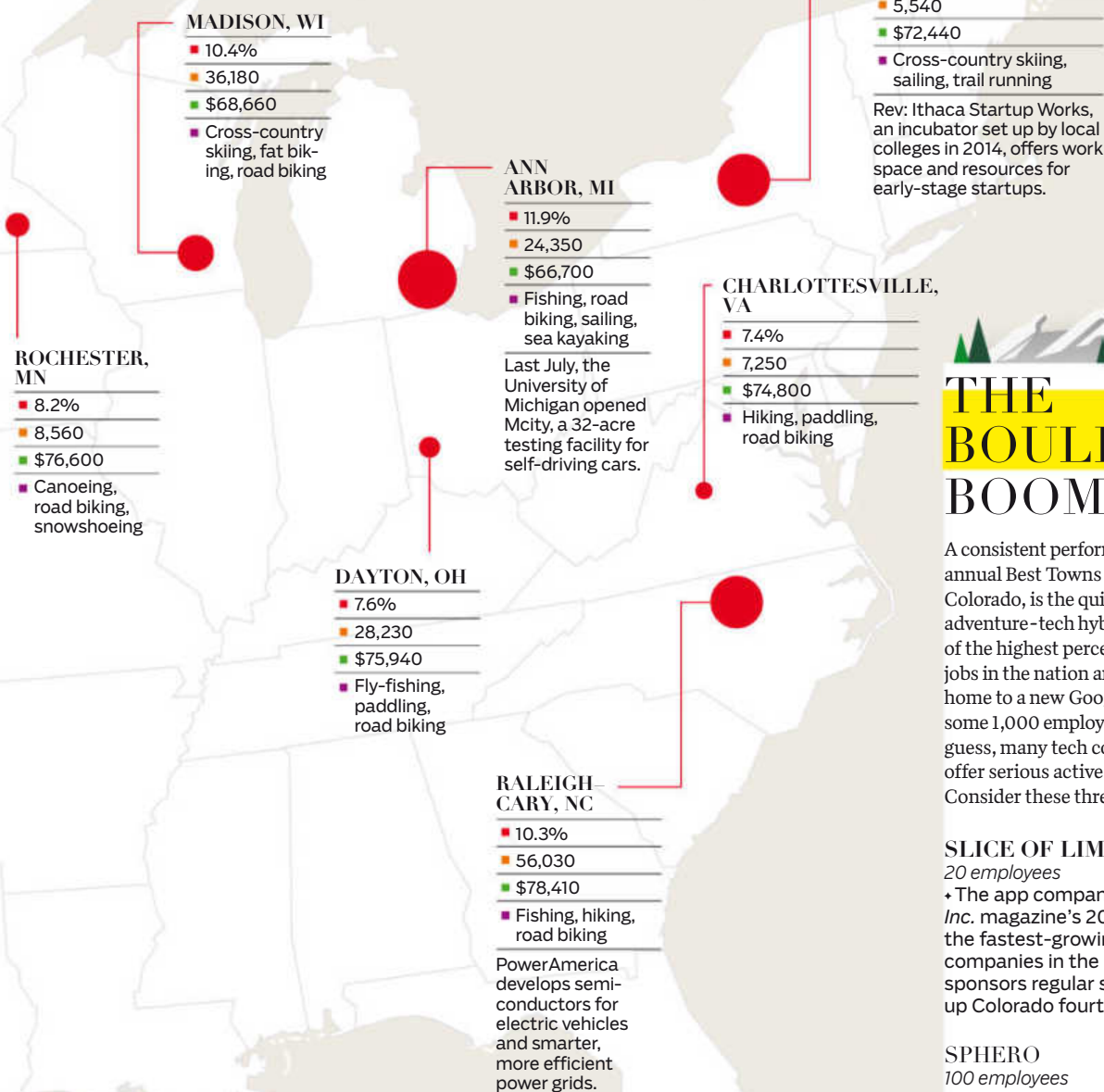
THE OUTDOOR LIFE IS A



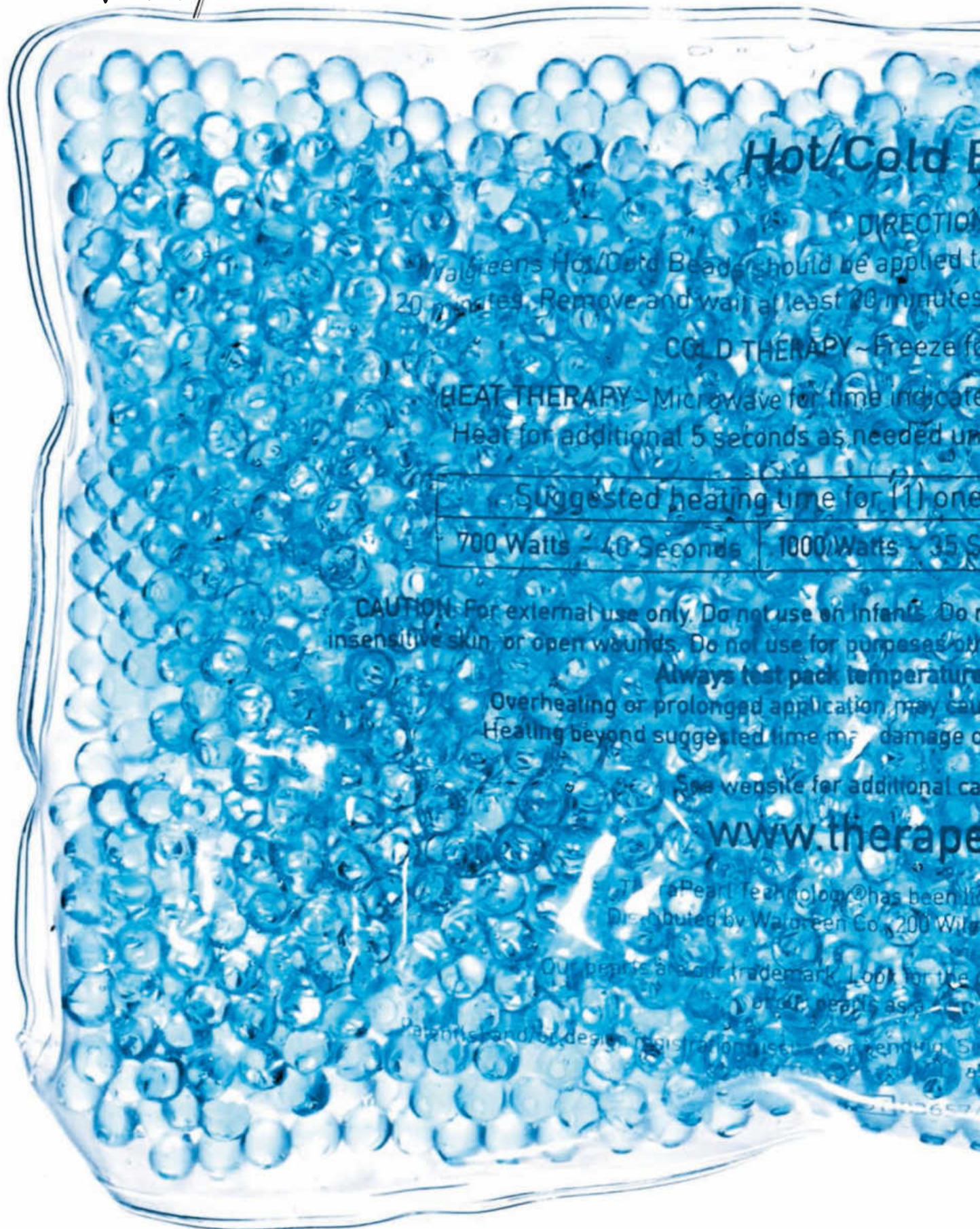
MAGNET FOR TECH GEEKS

Entrepreneurs and engineers are escaping Silicon Valley for towns that offer primo playgrounds

BY Jay Bennett



- STEM JOBS AS A PERCENTAGE OF TOTAL EMPLOYMENT
- NUMBER OF STEM JOBS
- MEDIAN STEM SALARY
- LOCAL FUN



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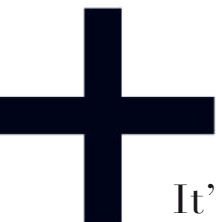
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60 IS THE NEW 25

Ned Overend is the defending national fat-bike champion, stomping racers who were in training pants when he was eligible for the AARP. Jon Billman examines the curious case of the man who gets faster with age.



It's two days after Ned Overend's 60th birthday, his back hurts, and he's staring into the weeds at Suicide Six—billed as one of the oldest ski areas in the East—puzzling out how to avoid a broken hip. He pushes his gray carbon cyclocross bike up a 30-degree slope, noting ruts, loose dirt, a toad, and the keen left curve that

tomorrow he'll be taking at considerable velocity during the finishing sprint of the Vermont Overland Adventure Ride. Overend—known to his fans simply as Ned, à la Sting or Prince—stands five foot eight, weighs 140 pounds, and walks slightly bow-legged, like a cowboy who has forked a horse every day for six decades.

"This isn't good," he says.

Ned is concerned about the myriad loose-gravel descents throughout the 52-mile grinder, essentially a cyclocross race on non-maintained roads. Event director Peter Vollers calls it a gentleman's race, since the purse is a faux-plaid-flannel jersey and bragging rights. "You do stupid shit when you're racing," Ned says. It's August now. He doesn't want an injury to jeopardize his fall season, which would upset his winter fat-bike season—with a new national title to defend.

Ned's backache was inflamed by the flight from California, where he spends part of the year working as a brand ambassador for Specialized. He arrived three days early to adjust for jet lag and check out the course. Vollers can't believe Ned has come to his race in only its second year. Like gravel-grinder racing in general, the Vermont Overland is swelling in popularity, and there are license plates in the parking lot from all over New England. A racer himself, Vollers shakes Ned's hand and asks if he'll roll through to meet some riders. Ned obliges, but he's anxious to recon the course, then get an IPA and hit the sack.

The next morning at the starting line, a field of nearly 500, including six-time national cyclocross champion Tim Johnson and pro roadie Jesse Anthony, fiddle with their Garmin as Vollers runs through announcements. When he lists Ned's greatest hits—the 1990 UCI Mountain Bike World Championship, his place in the Mountain Bike Hall of Fame, the recent 2015 USA Cycling National Fat Bike Championships title—there's an eruption: We get to ride with Ned!

But make no mistake, this is no ceremonial lap. "You gotta do more than schmooze and be an ex-racer," Ned says. And it's no comeback; he never went away. Nor does he race

with a handicap. "If you think, 'Well, I'm doing pretty good for an old guy,' then you're not trying to stay at the front," he told me. "You might be in the front of the old guys. But that's not enough."

The course climbs 5,900 feet over tarmac, ski slope, and "pavé," Vermont-speak for crumbly granite and rooty two-track. Ned is in the running most of the way, chasing a breakaway of three. He drops the steep line to the finish, coming in sixth, eight minutes behind winner Jesse Anthony. He's all smiles. Everyone wants to shake his hand.

Later I check on him at his motel, and he's got the shades closed; his laptop is glowing, and his reading glasses are on. For 25 years, he's been asked his secret. How does he cheat time, beat the clock? Finally, I'm gonna see Ned Overend's Dark Web, the ass-numbing training plans and age-reversing nostrums he buys on the secret Internet. Instead he

**"IF YOU THINK, 'WELL, I'M
DOING PRETTY GOOD FOR
AN OLD GUY,' THEN YOU'RE
NOT TRYING TO STAY AT THE
FRONT," OVEREND SAYS.**

shows me the Overland course, mapped out on Strava, with the excitement of a kid demonstrating his favorite video game. He went 48.5 miles per hour down the Cox District Descent. "That's pretty crazy speed on a dirt road," he says. On the Oxbow Road Climb he's got a King of the Mountain—the fastest time on a segment of trail or road—and tiny golden trophies are scattered across the screen. Ned's geeking out over all the little races, 22 of them, within the big race. Strava is his *New York Times* crossword, his sudoku.

HOW CAN IT be that a man who started riding when mountain-biking shoes were hiking boots is still relevant, still a threat, still a

champion in the age of electronic shifting? Back in 1985, when I was in high school, I saved enough summer pay to buy my first mountain bike. The shop smelled of new tires, and Ned's poster was on the wall. My ride was a champagne gold steel Schwinn Sierra, and I'd fantasize that I was Ned when I whizzed through the woods. Young gun John Tomac was a hero of mine, too, and fat-tire legend Tinker Juarez from his BMX days, but Ned had the Magnum P.I. mustache. I was certain he never used his granny gear.

One of six kids, Ned was the only athletic bird in the family tree. His father, Edmund, was a fighter pilot turned diplomat, and Ned was born in Taipei, Taiwan, in 1955. The family moved back and forth between Bethesda, Maryland, and posts abroad, including Ethiopia and Iran, until he was in tenth grade, in 1971, when they settled in Marin County, California. Two years later, Edmund died of a second heart attack, at 56.

Ned credits his running coach in high school, Doug Basham, for emphasizing high-intensity, low-volume workout programs. In junior college, Ned was selected for the 1976 California all-state team in cross country. But then he stopped running and moved to San Francisco to wrench motorcycles before working

his way through San Diego State University. There he shared an apartment with future Ironman Hall of Famer Bob Babbitt and began competing again—10Ks at first, then adding swimming and cycling with the goal of doing the 1980 Hawaii Ironman Triathlon. He and Babbitt trained in a 15-meter apartment pool, thousands of laps. Ned—a 2:28 marathoner—completed Hawaii twice.

In San Diego he met Pam Moog, a registered nurse, at a disco. They got married and settled in Durango, Colorado, where Ned took a job working on Volkswagen engines. They had two kids—Allison and Rhyler, now in their twenties and living in California. "Pam's life is not being a Ned fan," he says.



"I can go to an important World Cup event, and I'll be back home for a week before she'll ask me how I did." Pam still works part-time and spends some of the year in their second home in San Diego.

Ned was winning mountain runs until he injured his hip in 1981, which pushed him into road cycling. But the next year, he started riding a Schwinn Sidewinder in the dirt. He tried a mountain-bike race, won it, and was hooked. In 1984, at age 29, he got a contract with Schwinn and proceeded to dominate the National Off Road Bicycle Association circuit throughout the eighties; in 1988, he jumped to Specialized and won the first UCI World Championships, held in Durango in 1990.

But even at 35, Ned was considered old. In

1991, he told a *Sports Illustrated* reporter, "I crashed my road bike this spring and I ached for days. That didn't happen when I was 25." In the same article, John Tomac, then 24, said, "Age is really a state of mind. I think Ned can go until he's 40."

At 41, Ned finally retired from World Cup racing. He'd chosen mountain biking in part because doping wasn't prevalent in the sport. But by the mid-nineties, drugs had bled into the European mountain-bike scene, and he decided to get out. He's been outspoken ever since, going so far as to propose that future dopers be prosecuted as criminals. "It's theft," he says, "of millions of dollars in contracts."

People thought that was the end. But Ned,

↑
*Overend
at home in
Durango,
Colorado*

incognito without his mustache, was quietly kicking ass in different mediums: off-road triathlon, singlespeed racing, cyclocross, hill climbing, even cross-country skiing. "I didn't retire," he says. He

retooled and stayed on at Specialized to work in product development and marketing. In 1998, at 43, he raced his way to an Xterra World Championship off-road triathlon.

Pedal your time machine forward almost 20 years and Ned is dominating in the snow. He won the 2014 Fat Bike Birkie in Cable, Wisconsin—a race billing itself as the fat-bike national championships—and last year won the inaugural USA Cycling Fat Bike Nationals, at Powder Mountain, Utah, by 32 seconds. He trained by doing intervals on a snow-covered



fire road above Durango. “It’s not often a win is a surprise,” he says. “I wasn’t just there to experience Fat Bike Nationals—I went there to win.”

↑
*Training
above
Durango*

IF THERE’S ANOTHER athlete in another sport who has pushed success as far into their dotage, I don’t know who it is. Diana Nyad is still out there at 66, performing remarkable feats of endurance in the water. But while Ned gets older, his competition gets younger.

“Ned lives what I preach,” says Joe Friel, 72, masters coach and author of *Fast After 50*. “He’s always been a fan of short workouts with high intensity.” Whittled down, the recipe for success as a geezer is this: 1) Decrease volume and increase intensity. 2) Recover, recover, recover. 3) Don’t stop training, ever; you can retain much of your VO₂ max as you age, but once you lose it, it’s a lot harder to get it back. “When you’re 60, you can’t take a month off at the end of the season, have a good time like younger athletes can,” Friel says. “There’s an accelerated loss of fitness. Take Greg LeMond, for example—he just quit. Hung it up. Ned never did that.”

“Force times time,” says Northern Michigan University’s Scott Drum, an exercise physiologist who previously codirected the

NED IS GEEKING OUT OVER ALL THE LITTLE RACES WITHIN THE BIG RACE. STRAVA IS HIS NEW YORK TIMES CROSS- WORD, HIS SUDOKU.

High Altitude Performance Lab at Western State Colorado University in Gunnison. “The least amount of time with a lot of force equals longevity. After 30, we lose 1 percent a year in VO₂ max, unless you continue to train at a high intensity.” Another benefit, Drum says, is that “high-intensity exercise can elicit greater concentrations of growth hormone and epinephrine, leading to greater metabolic and muscular adaptations.”

Drum suggests training 10 to 15 hours per week, tops, for athletes over 40. With that recipe, Ned’s at no risk for overtraining syndrome. He pedals hard for an hour and a half, rarely much more, three or four times a week, and does easy rides on off days. In the winter, he mixes in nordic skiing and weight lifting, although the fat-biking season has taken time

away from cross-training. “I tried yoga, but I didn’t have the focus for it,” Ned says. “It’s amazing how little discipline I have for simple stretching and strengthening exercises.”

With the exception of Specialized lunch rides when he’s in California and his weekly group rides in Durango—the Tuesday Night World Championships—Ned trains solo. “I

do a lot of things by myself,” he says. But the Tuesday rides are more than his bridge club; they’re his weekly check-up. You can’t be too upset about getting dropped when the regulars include current national mountain-bike champion Howard Grotts, Israeli national champion Rotem Ishay, and pros Ian Burnett and Keegan Swensen. National cyclocross stars Todd and Troy Wells regularly come to hammer. All but the Wells brothers are under 30; none are over 40.

Ned has never had a cycling coach. “I don’t like structure,” he says. He doesn’t wear a heart-rate monitor or use a power meter. He relies on what he calls “perceived effort”—essentially going by feel. He does not appear to have a VO₂ max that’s off the charts; he just knows how to train smart.

PREVENTIVE MEASURES

STAY IN THE GAME LONGER AND STRONGER WITH A SOLID PREHAB ROUTINE —NICK HEIL

Among the most important things an athlete can do to preserve fitness for years to come is avoid injuries. Sprains, tears, and broken bones can resurface as nagging aches or weaknesses as you get older, preventing you from pushing yourself with the kind of high-intensity interval training that's so important for older athletes. Enter prehab, pre-exercise routines that prepare your body for the loads and stresses of a workout or race while also helping stave off injury. "It's a daily evaluation tool," says Eric Dannenberg, performance manager at Exos in Phoenix, "a way to make sure you can perform movements before you load your muscles." Dannenberg recommends doing each of the following five exercises before every hard workout. They'll add about seven minutes of warm-up, but the payoff will be huge when it comes to longevity in your sport. "Greatness isn't one game or race," says Dannenberg. "It's consistency of habits over many years."

1. Half Turkish Get-Up (unweighted)

Lie on your back, right leg extended, left leg bent so your foot is flat on the ground. Use your right arm to prop yourself into an upright seated position, with your right arm straight and your left elbow resting on your left knee. Push through the ground with your left heel to raise your hips toward the sky. As you do, raise your left arm so that it points at the ceiling. Repeat by lowering your butt to the ground, returning your left

arm to your knee, and driving your hips and arm back toward the ceiling.

2. Bear Crawl

On all fours, crawl forward ten steps, moving your opposing hands and legs forward at the same time. Stay low, with your back straight and your knees just a couple of inches off the floor. Finish by crawling backward the same distance.

3. Lunge with Twist

Step forward in a deep lunge. Plant both hands on the floor inside your forward foot.

Keep your back leg straight. Raise your inside hand toward the ceiling so your torso twists upward. Plant your raised hand on the outside of your forward foot and straighten your forward leg to achieve a deep stretch in your hamstring. Finish by returning to the standing position, feet together. Repeat on the opposite side. Alternate for six total reps.

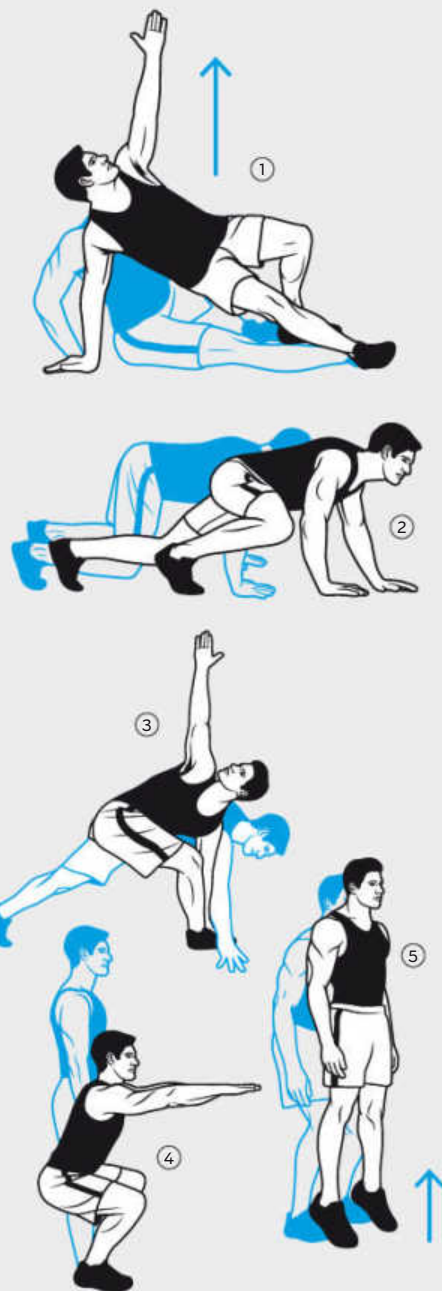
4. Bodyweight Squat

With feet a little more than shoulder width apart, lower your butt down and

back as deeply as you can without rounding your back. Keep heels grounded. As you move down, raise your arms so they extend straight in front of you. Your knees should stay over your toes. Keep your head up and your chest out. Do six reps.

5. Pogo Jump

Bounce on both feet in a full upright position, as if you're on a pogo stick. Continue for 15 seconds, then rest for 15 seconds. Do two sets, adding height or speed to make it more challenging.



"There are people as talented as me," he says. "What I've done is put together a few good races in a season, then manage to put a bunch of good years together." Tinker Juarez, 54, one of the last old-schoolers still in the saddle, broke his hip in June at a race in Mexico. Bike racing is a bone game, and for nearly 40 years Ned has managed to avoid a serious injury.

Sounds simple. But the man isn't rust-proof. "Shit wears out," he says. He pinches his forearm. "Your skin wears out." Did he mention his back is aching?

DURANGO, LATE September, and Ned's just gotten off the mountain, a demanding 42-mile solo over Coal Bank Pass on Highway 550. He's training for the Mount Diablo Challenge hill climb in California in October; now

he's gonna soak away his inflammation in the Animas River, as he does after hard rides.

The water has cleared up, but rocks along the bank are still yellow and orange from the Gold King Mine spill in August. "Just don't eat the mud," Ned says. No one else is swimming. He walks out into the current, chest deep, slips, and is carried ten yards downriver. He pops up laughing and spits out a mouthful of the 60-degree Animas.

The next afternoon, we ride the flowy singletrack at Overend Mountain Park. Ned stashes his reading glasses in his jersey pocket, in case he needs to adjust something small, like derailleur screws, or study the fine print on the Garmin. He's bashful about the park being named for him. "I don't need to be any more famous in this town," he says. The trails follow the natural contours of the Man-

cos Shale and are lined with burr oak, juniper, and piñon. Back in town a guy hollers, "Slow down, old man!" Even without the mustache, everyone recognizes him.

Durango is Ned's town. He swaps his trail bike for a step-through Globe with a wicker basket and a sticker on the frame: THIS BIKE CLIMBED MT. WASHINGTON. (Ned won the famous hill climb in 2011, on his 56th birthday.) He's known for his love of American IPAs; on a wild night he'll have two. At Carver Brewing on Main Street, there's a beer on tap called Ned's Nitro Pale Ale. An aluminum Fat Boy—lucky race number 13, his winning ride from last year's fat-bike championships—is displayed in the window of Mountain Bike Specialists.

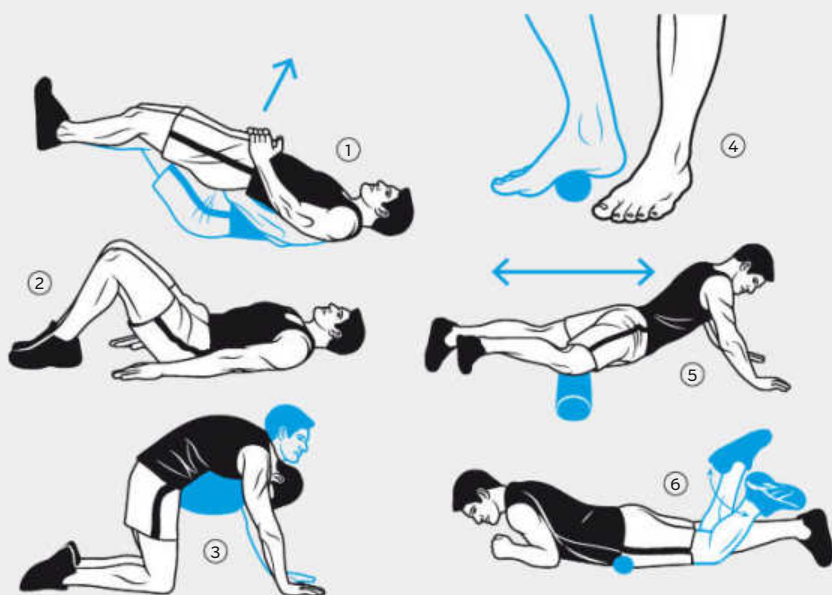
"It's pretty cool when you're 60 and improving your time from a couple years ago,"

REGULARLY SCHEDULED MAINTENANCE

GOING HARDER AS YOU GET OLDER REQUIRES ADOPTING A SMART RECOVERY ROUTINE NOW —N.H.

Superstuds like Ned Overend don't get that way by charging relentlessly through middle age. They understand that at least half the game involves recovering properly, which allows for consistent hard efforts without the detrimental effects of overtraining. A nutrient-rich, plant-heavy diet and lots of sleep are essential, but a recovery plan that includes daily breathing exercises, foam rolling, and mobility work will help you rebound even faster.

"A lot of top athletes come in wanting to improve their movement and speed, but their nervous system is out of whack or they're broken down," says Miguel Aragoncillo, a strength coach at Cressy Sports Performance in Hudson, Massachusetts. "There are techniques to help you regenerate between workouts and correct the problems." Here are six of Aragoncillo's favorite recovery exercises. Do them immediately following a workout, in the evening before bed, or during a rest day.



MOBILITY

1. 90-90 Hip Lift

Lie on your back with your feet on a wall, knees bent at 90 degrees. Place a ball or foam roller between your knees. Tilt your pelvis slightly forward. Squeeze the ball or roller, and lift your tailbone a couple of inches off the floor. Repeat five times. **Payoffs:** Improved posture; pelvic alignment

BREATHING

2. Deep Exhale

Lie flat on your back. Breathe in

deeply using your diaphragm. (Your belly should rise and fall rather than your chest.) Exhale as deeply as possible, holding at the end for a few seconds. Repeat for five breaths. **Payoffs:** Deeper sleep; relaxation

3. All-Fours Belly Lift

Get down on your hands and knees and draw in your breath, pulling from the front of your stomach toward your spine. Round your back, breathing into

the stretch. Repeat five times.

Payoff: Improved breathing

SELF-MASSAGE

4. Plantar Fascia

Roll a small, firm ball under the arch of your foot, applying pressure as needed. Hold it against sore spots for several seconds as tolerable.

Payoff: Foot mobility

5. Adductor

Lie on your stomach. Place a foam roller under the inside of your upper leg. Roll

back and forth, from groin to knee, gradually lowering your body weight onto muscles and soft tissue.

Payoffs: Balanced running mechanics; increased blood flow

6. Hip Flexor

On your stomach, place a ball just below your hip bone. Lower your weight onto the ball and roll it around that zone. Hold the ball against sore spots for several seconds

Payoff: Hip mobility



Ned says. "That's always a good indicator, right? I had the KOM on Rafter J until I made the mistake of telling my neighbor, then he went out and took it." You live and you learn.

Ned had skipped the Tuesday-night group to ride Coal Bank, sneaking out early between rain showers to get in some intervals. "Where were ya?" asks Todd Wells when we see him at his house. But Ned's just as happy riding solo with Strava.

"I'm getting old one day at a time," he says. "I only know how age affects you based on my own experiences. Otherwise you base it on what everyone else tells you. When my dad died at 56, I remember thinking, Dad died of old age. I mean, he had gray hair. People shouldn't just assume it should be so hard to hold onto your fitness."

When will he hang it up for good? Never, says Ned. But he can foresee a time when he switches from elite to master-class competition. "When I'm midpack," he says. "All it would take is to back off on my training."

Ned podiums on Mount Diablo, placing third. He broke away with the top three, but the leaders dropped him with a half-mile to go. "I was OK with the result," he says. "My back felt OK, but I think it had an effect on my preparation and maybe my motivation leading up to it. I noticed on Strava that my volume was down in September."

I got a text from him on the Sunday evening after the race: "The guy who won was 18!" He was referring to Jason Saltzman.

But Ned got it wrong: the kid was 17. **1**

CORRESPONDENT JON BILLMAN (@JONBILLMAN) IS THE AUTHOR OF WHEN WE WERE WOLVES. HE TEACHES AT NORTHERN MICHIGAN UNIVERSITY.

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and minus 264 degrees. The goal is to bring a person's skin temperature down to 40 degrees as quickly as possible and maintain that temperature for a minute or two. Adherents claim that this triggers the body to go into survival mode, sending blood from the extremities to the core, where it is enriched with oxygen and other nutrients. Afterward, as the body rewarms, the enhanced blood is pushed back to the extremities. The treatments are based on research pioneered by Japanese doctor Toshima Yamauchi, who invented the procedure in the 1970s to help patients with rheumatoid arthritis, noting that the majority of those who went through the process were completely relieved from their symptoms and pain.

At KryoLife, the first cryotherapy studio in New York City, which opened in April 2014, owner Joanna Fryben boasts the treatment's effectiveness for preventing joint swelling and reducing pain, boosting metabolism and weight loss, erasing wrinkles, and easing depression. With such promised results, who wouldn't want to freeze his ass off? Double-gold-winning distance runner Mo Farah has long been a fan, and Steve Weatherford, known as the fittest man in the NFL, espouses the benefits of his weekly trips to KryoGenesis in Paramus, New Jersey.

I tried a session at KryoLife last August. In a robe, gloves, and socks, I waited for my turn to enter the cryotherapy chamber. Once inside, my head sticking out from the top, a technician told me to toss the robe to him. Immediately, I felt the extreme chill of a fog-like vapor swirling around my body. For the next three minutes, the technician, who closely monitored how I was feeling, talked me through the experience, a welcome distraction from a stinging pain at the back of my knees and elbows. "Those are the areas where the skin is thinnest," he said. I danced around, waiting for my time to be up.

After exiting, clients are encouraged to warm up on a rowing machine or stationary bike for a few minutes. I didn't feel the surge of endorphins others mention. Instead I felt tired. But some patrons I met were emphatic that the treatment works. "What a rush," said

nutritionist Oz Garcia when he exited the tube, teeth chattering. He credits the treatments for weight loss (the body purportedly burns calories fighting the cold) and pain relief from a back injury, and said he's done cryotherapy at least 200 times. "It's not for everyone," he says, "but it has accrual results. It gives you a leaner, tighter body and better moods, and you're less inflamed."

Despite the buzz, the safety and effectiveness of cryotherapy chambers aren't well understood. The treatment lacks FDA approval, but there haven't been many reported incidents of safety issues other than a few cases of mild frostbite. The treatment did make headlines recently after an employee at a cryotherapy salon near Las Vegas died. As she was closing up on the night of October 19, 2015, Chelsea Ake-Salvacion reportedly texted her boyfriend that she planned to hop into a chamber for a quick session. The next morning, a coworker discovered her body frozen inside. Ake-Salvacion's death was ruled an accident.

As for cryotherapy's benefits for athletes, one study published by the National Institute of Sport, Expertise, and Performance in Paris evaluated inflammation levels in a group of runners who spent 48 minutes on a treadmill. In one trial, the runners did cryotherapy afterward, once a day for five days. The runners also tried daily 30-minute sessions of quiet sitting. The researchers reported that following cryotherapy, the runners had fewer blood markers of inflammation, suggesting that athletes could gain an edge through quicker recovery times.

Other researchers remain skeptical. A recent report from the University of Portsmouth in England, lead by university sport and exercise scientist Joseph Costello, reviewed studies that compared the effects of whole-body cryotherapy on muscle soreness with a placebo or no treatment at all in 64 active adults. The report found no evidence to suggest that the superchilled air had a positive effect on recovery. Costello concluded that much more research is needed to understand whether the therapy works.

Even more extreme is the controversial process of human cryopreservation, which has been around since the 1960s. Adherents count on a future in which molecular nanotechnology and other advances will be able to reverse the damage done to tissues during the freezing process, bringing frozen people back to life and then curing them of whatever killed them in the first place. The process looks something like this: The cryo company arranges to have staff on site when a client's heart stops. Within minutes they plunge the person into an ice bath and put him on life support to minimize brain-cell death.

They administer drugs to help keep the blood flowing, then circulate cryoprotectant chemicals throughout the body via an IV. In the end, the person is transported to the cryo facility in a stretcher-like basket filled with ice and then stored in minus-320.8-degree liquid nitrogen inside a vessel similar to a giant thermos bottle.

In Scottsdale, Arizona, the Alcor Life Extension Foundation currently has 141 people (and some of their pets) preserved. Among them are Hall of Fame baseball player Ted Williams, his son John Henry Williams, and Emmy Award-winning sitcom writer and producer Dick Jones.

Whole-body cryonics costs upwards of \$200,000, or you can go the cheaper route: \$80,000 to have your head lopped off and preserved, as Alcor cofounder Fred Chamberlain Jr. did in 2012. How will Chamberlain come back from the dead without a body? The company's answer: he'll grow a new one. So-called neuropsychopreservation is founded on the idea that a replacement body can be grown around the brain using future tissue-regeneration technology. After all, who wants to be immortal in an 80-year-old body?

LESSONS FROM THE FORMERLY FROZEN

In the meantime, survivors of extreme freezing may offer clues to the cryopreserved of the future. Anna Bagenholm holds the world record for living through the lowest core body temperature: 57 degrees. On May 20, 1999, the then 28-year-old was skiing with two friends down a waterfall gully in northern Norway when she fell into the water and became wedged between rocks under a thick layer of ice, with a pocket of air to breathe. Her friends tried to pry her to safety, but they quickly discovered that they couldn't free her and phoned for help, watching in anguish as she struggled. Forty minutes later, Bagenholm stopped moving.

About an hour passed before a rescue team arrived. They cut a hole in the ice and pulled Bagenholm's limp body out of the water. She wasn't breathing and had no detectable pulse. The paramedics started CPR, and a few minutes later a helicopter arrived to medevac her to Norway's Tromsø University hospital.

At the hospital, a team of cardiac surgeons, anesthesiologists, and nurses were waiting. They continued doing CPR and prepped Bagenholm for ECMO. As her core body temperature crept back up, her heart began beating again. Bagenholm spent six weeks in intensive care and eventually moved to a rehabilitation unit. Her mental function was completely normal upon waking, but her physical recovery took much longer. After

two years she returned to work and resumed some hiking and skiing. Today she's a radiologist in the hospital where she was saved, and she lectures at conferences about the potential to rescue others like her. She gets annoyed when she reads in the newspaper that a person was found in the cold and declared dead before they were taken to the hospital and rewarmed. "The most important thing is to not declare people dead outside. If it's possible, start CPR, take them into the hospital, put them on ECMO, and rewarm them with everything you've got. Don't give up. Even if it looks like the person is not going to make it, you have to keep on until it's really over."

Doug Brown, who emphasizes that doctors should use ECMO only when they believe a patient has a good chance for survival—that is, those like Christine Newman and Bagenholm who became severely cold before cardiac arrest—has created a group in British Columbia to establish clinical-practice guidelines for hypothermia. "Change in health care is very frustrating," he says. "Most places in the U.S. don't have protocols in place for getting hypothermic cardiac-arrest patients to ECMO."

Newman hasn't given any interviews about her accident, but she did release a YouTube video last March, near the one-year anniversary, in which she thanked her rescuers. Aside from some cold sensitivity in her hands and a few scars, including two on her thighs from the ECMO procedure and one on her back from being pulled out of the ice, she said she's feeling good and doing most of the things she has always enjoyed.

For Bagenholm, it took some time to fully grasp what had happened to her. She remembers waking up in the hospital after her accident. "I was paralyzed from the neck down, so I couldn't move," she says. Although she could remember other things about her life, the accident was a blank. "You know when you have a computer and you write on it, and then suddenly the power is out, everything on the hard drive is still there, but the things on the screen are gone. That's how it was for me," she says. "Everything I'd saved was still there, but the things that happened that day were gone. I still don't remember."

Bagenholm's case is often trumpeted as a miracle, but she doesn't believe her rescue was foreordained. "It's not a miracle," she says. "It's physiology. The miracle is that we've learned that it's possible to save people like me."

RENE EBERSOLE IS A WRITER AND EDITOR AT AUDUBON. HER WORK HAS ALSO APPEARED IN NAUTILUS AND MENTAL FLOSS, AMONG OTHERS.

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him. It caught on fire, he lost his water supply, his fuel bladder sprang a leak, and, just past French Guiana, he nearly smacked into a freighter. "The more challenging it is," he says, "the happier I am. The more rocks, the more ice, the better."

In fact, ADHD traits are so common among modern-day alpinists, rock climbers, BASE jumpers, snowboarders, and other extreme athletes that the observation raises several important questions: If adventure sports are such a great fit for people with ADHD, why aren't more doctors, schools, and families boosting participation? And, as kids are asked to sit still for longer periods of time indoors and given more medications to help them do it, what is the fate of the next generation of adventurers? Does the mass medicalization of ADHD mean the human species has reached peak exploration?

IF YOU'RE THE sort of person who eats chaos for breakfast, sitting in school all day may well suck out your soul. But with the rise of industrialism, educators thought all kids should be in standardized classrooms. "ADHD got its start 150 years ago when compulsory education got started," says Stephen Hinshaw, a psychologist at the University of California at Berkeley. "In that sense, you could say it's partially a social construct. If you look at the symptoms of ADHD, maybe they're not really symptoms anymore if you get in the right profession or the right ecological niche. We've learned some of this by looking at extreme athletes, who have found that niche."

But school often isn't it. To oversimplify, it's like taking kids who are genetically meant to be hunters and gatherers and making them tend crops instead. Not only will they feel bored and inadequate, but the constrained setting will actually make their symptoms worse. For kids like Zack, school feels stifling and rule bound. They act up. They may get moved into even more restrictive environments, sometimes with chain-link fences, guards, and neurotropic meds that go beyond ADHD to deal with the ensuing anxiety, depression, and aggression. Sometimes they

end up in trouble or, as Zack feared might happen to him, get "gooned" in the middle of the night by burly strangers intent on packing him off to a residential therapeutic program that looks like Outward Bound in the brochure but ends up feeling like a gulag.

Interestingly, researchers have observed similar patterns in lab rats—who, let's face it, suffer the ultimate cosmic gooning. When Jaak Panksepp, a neuroscientist at Washington State University, restricted the play of young rats, their frontal lobes (which control executive function) failed to grow normally. "We had the insight that if animals don't play, if there are not sufficient spaces for them to engage, they develop play hunger," says Panksepp. "They have impulse-control problems and eventually problems with social interactions."

Panksepp points out that while common stimulant medications for ADHD like Ritalin and Adderall may improve attention skills and academic performance in many kids, they do so at the cost of reducing the playfulness urge—at least temporarily. "We know these are anti-play drugs in animals," he says. "That is clear and unambiguous." The bigger question is whether the drugs—and all the enforced sedentary behavior—squeeze the adventure impulse out of kids in the longer term. Psychologists tend to disagree on this point, but the truth is, no one really knows. It's not a boutique question. Of the 6.4 million diagnosed kids in America, about half are taking prescription stimulants, an increase of 28 percent since 2007.

For athletes like Corliss and swimmer Michael Phelps, who has also been diagnosed with ADHD, the sport itself becomes their medication, filling their brains with endorphins and endocannabinoids. But for every hour that a drug is supplying a kid's fix, that's an hour a potential explorer is not looking longingly out the window plotting escape. Of course, some kids, Hinshaw points out, need medication even to make big plans, not to mention learn algebra. Other families, he notes, are seeing the value in medication holidays, allowing kids to come off their drugs on weekends and during summers.

At SOAR, many students arrive on meds, and many stay on them. At all times, the instructors have locked and sealed messenger bags full of pharmaceuticals strapped to their torsos like baby marsupials. Though Willson emphasizes that SOAR is not a way to get kids off ADHD meds, some do find that they can taper off. Zack's parents said they're planning to toss his during his holiday break, and they expect to lower the dose of his stimulant as well. "The changes in him have been nothing short of miraculous," says his mother, Marlene De Pecol. "Now he's just happy!"

ADHD

Taking meds didn't seem to alter the daring trajectory of solo sailor Rutherford. He took multiple pills for six years until he was 16, when, like Zack, he managed to find a place more compatible with his brain's wiring—the Eagle Rock School in Estes Park, Colorado, an adventure-based boarding school funded by the American Honda Education Corporation. Anker, meanwhile, says it's possible he wouldn't be making first ascents today if he'd taken Ritalin through his teenage years. His parents encouraged him to go outside instead. Climbing developed his technical mastery while helping him sit still when he needed to. It also likely helped his prefrontal cortex mature. The senior Ankers were ahead of the curve, or perhaps about 10,000 years behind the curve, depending on how you look at it.

The fact is, all human children learn by exploration, and we are tying their shoelaces together—not just with medication, but through over-structured, over-managed classrooms and sports teams, less freedom to roam, and ever more dazzling indoor seductions. Modern life has made all of us distractible and overwhelmed. As McGill's Levitin explains, the average American owns and must keep track of thousands of times more possessions than the average hunter-gatherer. Each of us, one 2013 study projected, consumes 74 gigabytes daily. Teens now interact with screens more than six and a half hours per day, and that's not including time at school, according to Common Sense Media, a nonprofit that helps parents make smart technology choices. "The digital age is profoundly narrowing our horizons and our creativity, not to mention our bodies and physiological capabilities," says environmental photographer James Balog, even as his hard-won chronicles of a changing planet are delivered to millions digitally. Yet Balog, who says he has mild ADHD, can hardly get his eighth-grade daughter off her phone. "These are hours not being spent outside," he says. "It kills me."

The news isn't all bad. While per capita visits to natural areas are down, participation by young people in a number of adventure sports like snowboarding and rock climbing is up. Solid research continues to make the case that kids benefit from time outside and regular exercise, and some schools are getting the message by instituting early-morning programs. More psychiatrists are also prescribing exercise for kids with ADHD. But the National Institute of Mental Health makes no mention of physical activity as a treatment option on its extensive website.

The radio silence on exercise is surprising, because studies consistently show that

aerobic activity targets the same attentional networks that ADHD medication does. While fitness improves learning in both kids and adults, it's adolescents like Zack—whose prefrontal cortex is in the very midst of laying down a lifetime of hardware—who seem to benefit the most. John Green, a biobehavioral psychologist at the University of Vermont, and graduate student Meghan Eddy exercised some adult and juvenile rats and then tasked them with learning how to find food in a maze. The young rats who exercised bested the non-exercisers and did as well as rats on Ritalin. It seemed the playful and exploratory adolescent years exist to boost learning in mammals, just as SOAR's Willson intuited. Or, as Green more formally puts it, "The adolescent prefrontal cortex is ready to be molded by environmental experience."

So there you have it: the time is now. There's a limited window to best launch these kids and, perhaps in so doing, safeguard a future of innovative exploration by the very young people who are wired to do it better than anybody else.

The ADHD population is an advance guard. If they can recognize how to better adapt their environments for their brains, there's hope for the rest of us.

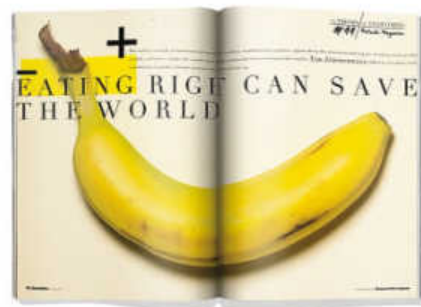
AFTER MANY YEARS languishing in the Formica-filled classrooms of West Hartford, Zack Smith is ready. He and his pals gather around the fire pit back at camp, bellies full of hamburgers and pickles. It's very dark out. Tomorrow all 14 boys will make the four pitches up the South Peak at Seneca Rocks. A couple of days after that, they'll backpack across the Dolly Sods Wilderness Area, and then they'll visit Stonewall Jackson's grave and read poetry written by the general's sister-in-law. For now, they're tired if not exactly mellow.

Zack's job for the day is Captain Planet, meaning he's the mighty taker-out of trash. Another kid named Max is Scribe. At 16, Max is an expeller of colossal farts, and proud of it. "I don't do anything halfway in the outdoors," he says. He shared with me on the trail that he is also an expert squirrel hunter, climber, and river runner. When he is done with school, he intends to find a job guiding. Now, be-turbaned in a purple bandana, he opens the group journal and prepares to record notes on the day's events under the narrow red beam of a headlamp.

Zack is lying on his back and looking up at the stars. He is impressed. "We don't have these at home," he says.

CONTRIBUTING EDITOR FLORENCE WILLIAMS IS THE AUTHOR OF *BREASTS: A NATURAL AND UNNATURAL HISTORY*.

EATING RIGHT continued from page 85



probably of greater benefit to the planet than mine. I also consider the irony that I flew to Halifax to report a story on sustainability, the equivalent of eating roughly 40 pounds of steak.

Sustainability, it seems, is a little like religion: we're all striving for an ideal, but it's difficult, if not impossible, to achieve perfection. We sin a little here. We sin a little there. The omnivore who hunts for an elk each fall for his meat—or maybe even eats roadkill—and raises his own chickens for eggs, grows his own organic vegetables and fruit, and cans food for the winter is eating pretty damn sustainably. So is the backyard-gardening vegan. But that's a degree of virtue many of us will never achieve.

Still, a few simple adjustments help a lot. Stop worrying so much about not getting enough protein, and remember that plant-based protein is a lot easier on the planet than animal protein. Buy organic food whenever you can. Source your food as locally as possible, and eat seasonally to avoid racking up major food miles. Eat less and waste less. Be open-minded and creative about new cuisines. Relax. Have fun. Sustainable eating isn't synonymous with masochism.

"We think of everything related to the environment as something we are doing wrong or have to give up," Dan Barber says. "But people can do something about it in a way that is pleasurable. We can actualize change through hedonism."

Who can't rally behind that?

CORRESPONDENT TIM ZIMMERMANN WROTE ABOUT SUSTAINABLE SEAFOOD IN JUNE 2015.

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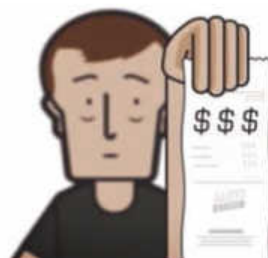
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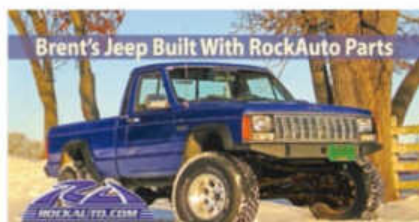
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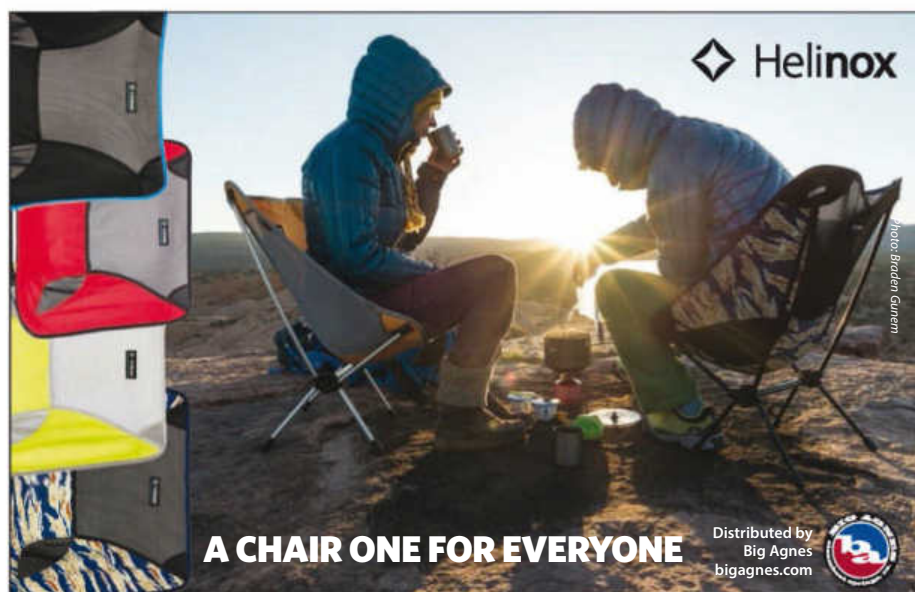
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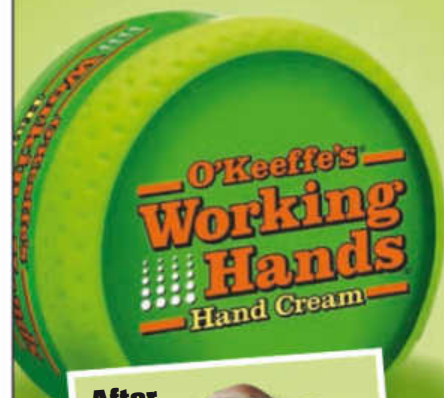
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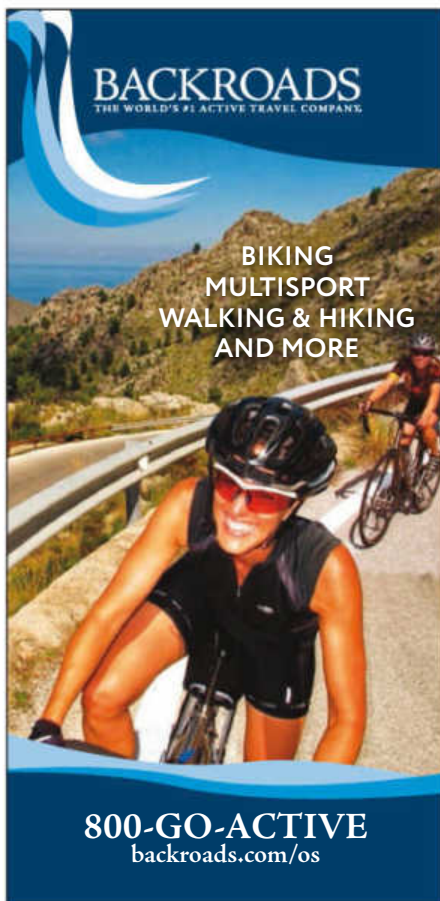


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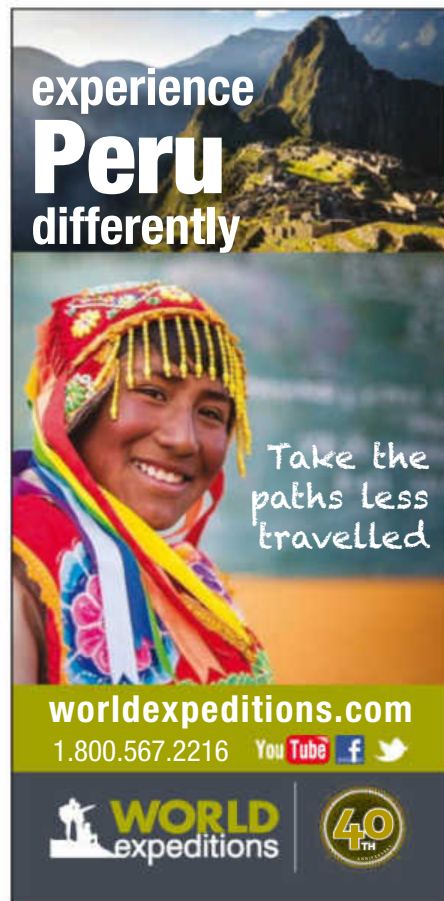
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